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# GREAT LAKES 2000 CLEANUP FUND

*PARTNERSHIPS for the Great Lakes*



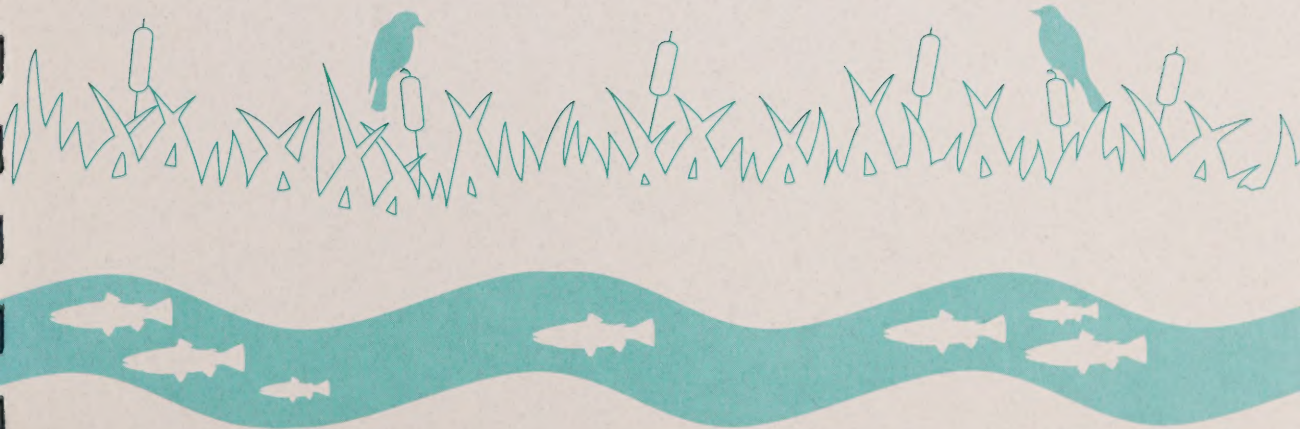
# FONDS D'ASSAINISSEMENT DES GRANDS LACS 2000

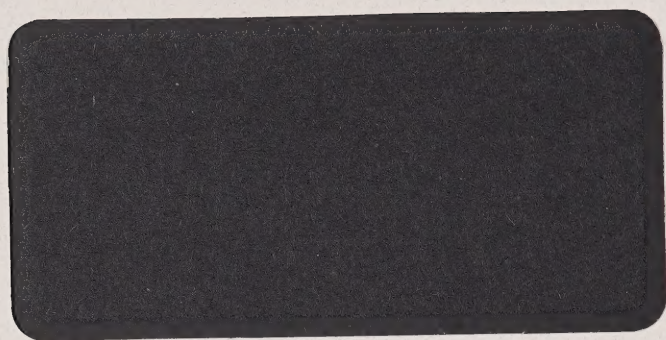
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## GREAT LAKES 2000 CLEANUP FUND PROJECT SUMMARIES REPORT New, Ongoing and Completed Projects as of March 1997





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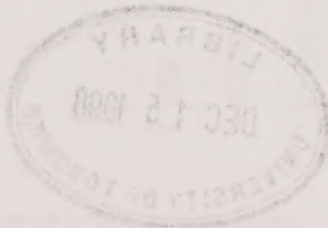
**GREAT LAKES 2000 CLEANUP FUND  
PROJECT SUMMARIES REPORT  
New, Ongoing and Completed Projects  
as of March 1997**

**Copies of this report** are available through this office or through our internet website, where information concerning the **Great Lakes 2000 Cleanup Fund** can also be found:  
<http://www.cciw.ca/green-lane/cuf/intro.html>

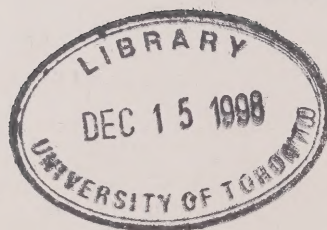
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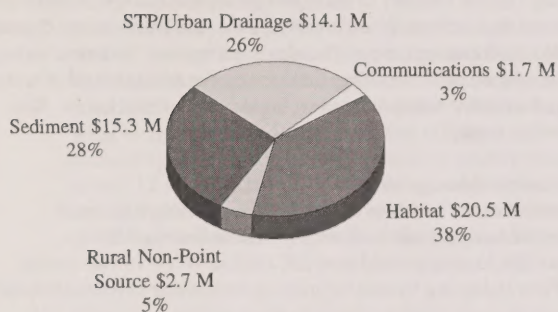




## EXECUTIVE SUMMARY

The Great Lakes 2000 Cleanup Fund (GLCUF) supports two kinds of projects: (i) generic technology demonstration projects with application to all or several Great Lakes Areas of Concern (AOCs), described in Part I; and (ii) remediation projects specific to a particular lake or AOC, described in Part II. This report provides a brief description of each of the 239 projects supported by the Cleanup Fund from 1990/91 through 1996/97.

### RESOURCES BY PRIORITY

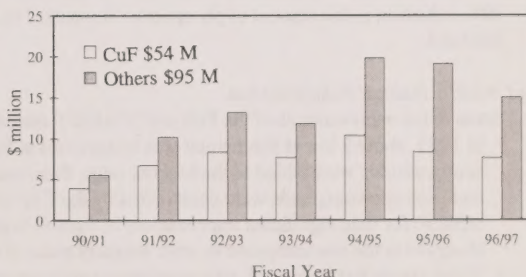


Projects have been carried out in all 17 Canadian Areas of Concern, under the Fund's priority issues of contaminated sediment remediation, fish and wildlife habitat rehabilitation, municipal sewage treatment plant optimization, urban runoff and stormwater control, rural non-point source pollution control, and communications. Many projects are showing success in terms of improvements to water quality, rehabilitation of aquatic habitat, and achieving cost-savings by demonstrating innovative low-cost alternatives. The biggest success occurred in 1994, when Collingwood Harbour was delisted as an Area of Concern.

In each of the AOCs, joint Canada-Ontario technical teams are developing and implementing Remedial Action Plans (RAPs) in cooperation with the public, municipal governments, and the private sector to restore impaired beneficial uses. RAP Teams, together with Public Advisory Committees (PACs) build partnerships between government, businesses and communities to generate involvement, commitment and public awareness.

### BUILDING PARTNERSHIPS

The Cleanup Fund has spent approximately \$54 million on these projects; this was supplemented by \$95 million from nearly 400 partners from various levels of government, Conservation Authorities, private businesses and industries, environmental groups, and local landowners.



The Cleanup Fund was formed in 1990, as part of the Government of Canada's Great Lakes Action Plan, and represents a significant part of Canada's commitment to restore the Great Lakes Basin Ecosystem as outlined in the 1987 Protocol to the Canada-U.S. Great Lakes Water Quality Agreement (GLWQA). The follow-up program, Great Lakes 2000, confirmed that the Cleanup Fund's resources would remain focussed on demonstrating technologies and remedial measures for the restoration of impaired beneficial uses in Canada's AOCs.

The Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA), signed in 1994, sets firm

environmental targets for both the federal and provincial governments until the year 2000, and facilitates implementation of the GLWQA. The Great Lakes 2000 Cleanup Fund helps the federal government meet these targets.

Some of the Great Lakes 2000 Cleanup Fund's success stories include:

*Contaminated Sediment Remediation:*

- ✓ A full-scale removal of 10,000 m<sup>3</sup> of sediment contaminated with heavy metals was carried out in the Welland River, using a Canadian manufactured "Amphibex" dredge, designed for shallow waters where conventional dredges do not work;
- ✓ Commercial contracts were won by six sediment remediation technologies following demonstration by the Great Lakes 2000 Cleanup Fund;
- ✓ A five party cooperative initiative between the Ontario Ministry of the Environment and Energy, Abitibi Consolidated Inc., Canadian National Railway Co., Northern Wood Preservers Inc. and Environment Canada has been formed to clean-up the Northern Woods Preservers site in Thunder Bay Harbour. Sediment surveys have defined the nature, volume and extent of contamination enabling the demarcation of 13,000 m<sup>3</sup> of acutely toxic sediment in one of the most severely contaminated sediment sites on the Canadian Great Lakes. The Cleanup Fund is contributing \$3.3 million to this project.

*Combined Sewer Overflows (CSO) Control and Stormwater Management:*

- ✓ In addition to environmental benefits, demonstrations of low-cost alternatives for reducing CSOs and improving stormwater management are expected to save municipalities \$18 million/year in AOCs;
- ✓ Treatment of combined sewer overflow at satellite locations could save \$50 million over a 10 year period;
- ✓ Implementation of the innovative Dunkers Flow Balancing System for treating stormwater saved the City of Scarborough \$17 million.

*Municipal and Industrial Wastewater Treatment:*

- ✓ Sewage treatment plant process audits costing \$720,000 saved \$18.8 million for the Town of Midland, the Town of Collingwood and the City of Windsor;
- ✓ Projected savings for using innovative approaches to remove ammonia toxicity from effluents at all Ontario STPs is \$1.2 billion;
- ✓ Use of the low-cost on-off aeration process for removing ammonia toxicity at the Tillsonburg Sewage Treatment Plant resulted in an energy reduction of 25%;
- ✓ The pilot demonstration of the biological aerated filter (BAF) process proposed for upgrading sewage treatment to secondary treatment standards identified a cost saving of over \$33 million for the City of Windsor;
- ✓ 90% reduction in the amount of phosphorus discharged to Penetanguishene Bay, Severn Sound AOC, has been achieved.

*Fish and Wildlife Habitat Rehabilitation:*

- ✓ Some of the achievements of the Fish and Wildlife Restoration Project in Hamilton Harbour are:
  - In 1993, about 2 km of fish habitat was constructed at Bayfront Park; over 50 different shoreline configurations were added to the harbour edge, three coastal wetlands were created, two beaches, underwater reefs and spawning beds were constructed by the City of Hamilton; underwater habitat modules were placed offshore for fish; significant improvement in aquatic vegetation and a fourfold increase in fish have been observed at the site compared to other adjacent areas of the Harbour;
  - Water clarity has improved, pike populations are increasing and aquatic plant and wildlife are returning to Cootes Paradise;
  - Fish habitat improvements in LaSalle Park have resulted in up to 18 different fish species using the near shore instead of the 6 to 8 species observed prior to the restoration project; turtles are now seen basking and migratory ducks are seen in large numbers;
  - In 1996, 325 nesting pairs of Caspian terns, 478 nesting pairs of common terns, 16 nesting pairs of black-crowned night-herons, 137 pairs of ring billed gulls and 62 nesting pairs of herring gulls have been identified in the northeastern shoreline; the fish community has diversified from the 4-6 species observed prior to restoration to the 16 species now found;



- ✓ A baseline of existing and historic wetland and riparian habitat conditions is being established through the use of Geographic Information System technology in six AOCs: Thunder Bay, Severn Sound, Metropolitan Toronto and Region, St. Clair River, Niagara River, and St. Lawrence River. The information will be used to identify and prioritize opportunities for rehabilitation, as well as to develop long-term habitat management plans for each of the AOCs;
- ✓ Approximately 571 ha of wetland and 175 km of riparian habitat have been restored, through Great Lakes 2000 Cleanup Fund initiatives; another 2832 ha of wetland and 206 km of riparian habitat have been protected;
- ✓ Not only are projects cleaning-up the environment and rehabilitating habitat, but several of them have generated documents that enable the transfer of knowledge and technology.


#### *Rural Non-Point Source (NPS) Projects:*

- ✓ Initiatives to improve surface water quality through the reduction of non-point source pollution sources such as: erosion, faulty private septic systems, improper and/or inadequate manure management and milkhouse wastewater treatment, and barnyard runoff, are being undertaken in 9 AOCs;
- ✓ A computer model was developed to quantify the loading reductions of phosphorus and bacteria from rural water quality control projects in the Bay of Quinte. The model estimated a cost saving of \$1.6 M would be realized by adopting a “trading” scenario to achieve phosphorus reductions of 16 tonnes, instead of reductions of only 12 tonnes achieved through the more costly “no trading” scenario. Phosphorus “trading” involves the buying and selling of phosphorus reduction credits. Sewage treatment plants buy credits from farmers, thus offsetting increased phosphorus loads by implementing non-point source projects elsewhere in the watershed.

#### *Other Benefits:*

- ✓ With \$149 million worth of project activity, these environmental initiatives are not only showing improvements in valued Great Lakes natural resources, but are also providing rewards in terms of job creation, economic returns and an improved standard of living for the local community, in addition to significant potential global market opportunities.





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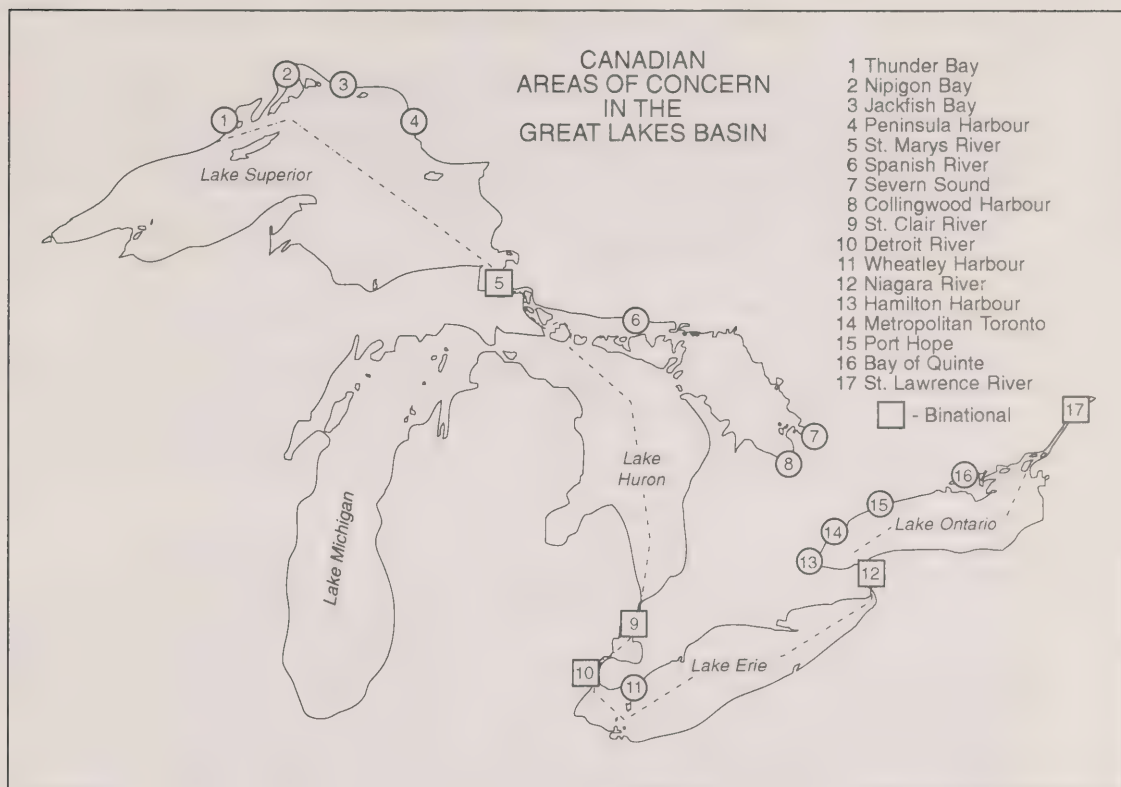
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## PART I - GENERIC PROJECTS APPLICABLE TO ALL OR SEVERAL AOCs



## 1.0 CONTAMINATED SEDIMENT REMEDIATION

### 1.0.1 Cable Arm ETV Program Pilot Project

Start Date: 1996                      Contact: Ian Orchard, Environment Canada  
Status:     New                                      (416) 739-5874

A pilot-scale project is underway to apply the Environmental Technology Verification (ETV) Program to test performance claims of the Cable Arm bucket dredge technology. The ETV Program, a joint Environment Canada - Industry Canada initiative, is designed to support Canada's environmental industry by providing credible and independent verification of new and innovative technology performance claims. Companies whose claims are confirmed will be entitled to use the ETV verification mark and accompanying certificate in their marketing activities in Canada and abroad. Cable Arm Inc. is also providing support to this project.

### 1.0.2 Hobbs-Miller Biological Treatability Study

Start Date: 1996                      Contact: Wayne Randle, Water Technology International Corporation  
Status:     New                                      (905) 336-8914

Sediments from Thunder Bay (contaminated with PAHs) and Lyon's Creek (contaminated with PCBs) will be treated using the Hobbs and Miller process. Once the biological treatability study is complete, the process will be evaluated for its potential use in the proposed full-scale clean-up at Thunder Bay.

### 1.0.3 Sediment Remediation Technology

Start Date: 1990                      Contact: Ian Orchard, Environment Canada  
Status:     Complete                                      (416) 739-5874

Innovative technologies for the remediation of contaminated sediments while causing minimal disturbance of the environment have been identified and successfully demonstrated. Descriptions of demonstration projects can be found in the following sections of this report: Collingwood Harbour (Pneuma Pump), Hamilton Harbour (Cable Arm Bucket), Metropolitan Toronto and Region (Cable Arm Bucket and Amphibex), Niagara River (Mudcat and Amphibex), Severn Sound (Visor Grab and Amphibex/Air-injection) and Port Hope (Eriksson Sediment Systems). Collaborating agencies include the Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Centre for Environmental Technology Advancement, Atomic Energy of Canada Ltd., Eriksson Sediment Systems Inc., Atlas Specialty Steels Inc., Metropolitan Toronto and Region Conservation Authority, Niagara Peninsula Conservation Authority, Ontario Hydro, Royal Canadian Yacht Club, Toronto Harbour Commissioners, Hamilton Harbour Commissioners, Regional Municipality of Hamilton-Wentworth, Regional Municipality of Niagara, City of Hamilton, City of Welland, Stelco Inc., Dofasco Inc., Transport Canada, Office of the Minister of Communications, CSL Equity Investments Limited, Town of Collingwood, Aquateers of Canada, Collingwood Terminals, Collingwood Library, Niagara River RAP, Wye Marsh Wildlife Centre, and Grace Dearborn Environmental Engineering Group.

#### 1.0.3.1 Sediment Assessment - OMOEE/MTRCA (Completed '96)

To determine clean-up requirements and prioritize areas for remedial action, various sites with contaminated sediment were characterized using laboratory bioassays, biological and chemical/physical parameters and by the application of sediment guidelines. Sediment assessment was done for samples taken from Meyer's Pier Park (Bay of Quinte AOC), Thunder Bay Harbour near Northern Wood Preservers (Thunder Bay AOC) and Grenadier Pond (Metropolitan Toronto and Region AOC). The Ontario Ministry of Environment and Energy, and Metropolitan Toronto and Region Conservation Authority also supported this project.

#### 1.0.3.2 Positioning System for Dredging Technologies (Completed '95)

In 1995, at Ontario Hydro's Pickering Nuclear Generating Station, the Cable Arm Bucket was used in its first commercial application. To enhance the accuracy of the clamshell bucket dredge, a 'z' (3 Dimensional) positioning system was developed and tested. By improving the accuracy of removal, a 'z' coordinate positioning system should require less handling of removed material, thereby reducing overall costs of full-scale projects. Environment Canada's Remediation Technologies Program provided scientific and technical advice during the operation. This project was also supported by Ontario Hydro. This project is also listed under 10.2.4 Positioning System for Dredging Technologies.

This demonstration provided data with which to establish operating parameters for future full-scale removal projects, such as Randle Reef in Hamilton Harbour (*See Hamilton Harbour Projects - Sediment Removal Demonstrations, Project 10.1.3.3*).

#### *1.0.4 Sediment Treatment Technology Database (SEDTEC)*

Start Date: 1991                      Contact: Ian Orchard, Environment Canada  
Status: Ongoing                      (416) 739-5874

SEDTEC is a multi-purpose electronic directory developed jointly by Environment Canada and the Water Technology International Corporation. This unique directory has powerful search options that link to technologies for removal and treatment of contaminated sediments. Compiled from submissions by vendors and developers worldwide, it identifies and catalogues some 250 technologies, 29 of which were demonstrated and audited by the Great Lakes 2000 Cleanup Fund and its partners. SEDTEC is marketed globally by the Remediation Technologies Program and is available on compact disk with anticipated upgrades. (Refer to Project 1.0.5 *SEDTEC Case Studies*)

#### *1.0.5 SEDTEC Case Studies*

Start Date: 1996                      Contact: Ian Orchard, Environment Canada  
Status: New                              (416) 739-5874

The SEDTEC case studies highlight ten sediment removal projects that were supported by the Great Lakes 2000 Cleanup Fund. These case studies are incorporated into SEDTEC, a comprehensive directory of sediment and treatment technologies developed by Environment Canada. (Refer to Project 1.0.4 *Sediment Treatment Technology Database (SEDTEC)*)

#### *1.0.6 Contaminated Sediment Treatment*

Start Date: 1990                      Contact: Craig Wardlaw, Water Technology International Corporation  
Status: Ongoing                      (905) 336-4691

Since 1990, 250 expressions of interest to demonstrate sediment treatment technologies have been received and reviewed. Following the review of detailed proposals, 24 technologies were selected for bench-scale demonstrations. Eight of these technologies were selected for pilot-scale testing at six demonstration sites. Activities under this program which apply to specific demonstrations are described under the Hamilton Harbour (EcoLogic, Dearborn, Limnifix), Metropolitan Toronto and Region (THC Soil Recycling), St. Lawrence River, Niagara River (Acres/Derrick), sections of this report. In addition, WTI is performing sediment characterization studies for a project to remove sediment from Oshawa Harbour. Projects applicable to all areas of concern are described below. Other funding agencies include the Ontario Ministry of Environment and Energy, Atlas Specialty Steels Inc., Eli EcoLogic Inc., Toronto Harbour Commissioners, Demonstration and Development of Site Remediation Technologies Program, Acres/Derrick, SNC-Lavalin, Dearborn Inc., and Tallon Inc.

##### *1.0.6.1 Sediment Remediation Guidance Manual (Complete)*

The Permanent International Association of Navigational Congresses (PIANC) formed a committee to write a guidance manual entitled: "Handling and Treatment of Contaminated Dredged Material". The manual, which will be of use to RAP teams, harbour authorities, government officials, technology vendors, and consultants, has been completed.

##### *1.0.6.2 Treatability Studies (Ongoing)*

Several treatability studies have been conducted to assist RAP teams in deciding which remedial options to choose for their contaminated sediment problems. In conjunction with the Cable Arm demonstration, one study determined that the sediment from Ontario Hydro's sediment removal project did not require treatment. Further details on treatability studies can be found in the St. Lawrence River, Hamilton Harbour, Thunder Bay, Wheatley Harbour and Metropolitan Toronto and Region sections of this report.

##### *1.0.6.3 Bench-Scale Demonstrations (Complete)*

Bench and pilot-scale demonstrations have been undertaken for the following technologies:

- ◆ Acres/Derrick Pre-Treatment: Acres International of Niagara Falls, Ontario (using technology developed by



Derrick Manufacturing of Buffalo), conducted bench- and pilot-scale tests on metal contaminated Welland River sediment. The sediment was subjected to settling and other separation tests and a number of screening trials. (Completed Aug. '92)

- ◆ Altech Sediment Washing: Welland River sediments were used in the bench-scale testing of a grain size separator (screens), an attrition scrubbing chamber (in which surfactants and other chemicals can be added) and a floatation chamber (in which contaminants are skimmed off the surface of the water after being floated by air and polymers). (Completed Oct. '92)
- ◆ Alberta Oil Sands Technology and Research Authority (AOSTRA) Taciuk Processor: The technology was originally developed to produce oil from Athabasca oil sands in Alberta. It is now being leased by UMATAC Industrial Processes for waste treatment applications. The procedure was tested at bench-scale on sediments from Hamilton Harbour and Thunder Bay. A rotating thermal processing unit separated the slurred waste or soil into 3 components: soil, hydrocarbon and water fractions. (Completed Aug. '91)
- ◆ Alberta Research Council (ARC) Coal Agglomeration: The ARC technology is based on the theory that finely ground coal will absorb organic compounds. The theory was tested at bench-scale by mixing coal with sediments from Hamilton Harbour. Absorption was allowed to occur and the product was removed from the matrix using a floatation chamber. (Completed Apr. '92)
- ◆ Bergmann Soil Washing: This water-based soil washing technology separates sediment by physical processes (i.e. attrition scrubbing, screening, elutriation) into size fractions. Each fraction has a distinct contaminant level and reduces the total volume of sediment requiring further treatment. (Completed Feb. '93)
- ◆ Biogenesis Soil Washing: This technology may be applied to release organic and/or metal contaminants from the sediment. Chemicals beneficial to the indigenous biomass are used in the soil washing process. Organic contaminants not extracted from the sediment will be biodegraded, to some extent, by the indigenous bacteria. (Completed Sept. '93)
- ◆ Beak Consultants Sequential Leaching: Welland River sediments, highly contaminated with metals, were treated at bench-scale with water-based leaching solutions. The solutions used were distilled water (as a control), acidic water, basic water, and water treated with EDTA (a chelating agent). (Completed Nov. '92)
- ◆ BEST Process: This process, developed by the Resources Conservation Company, is a unique solvent extraction technology that removes organic contaminants from soil or sediment. RCC performed bench-scale tests on Thunder Bay sediment. The final report has been received. (Completed Sept. '94)
- ◆ COGNIS Metal Extraction: Proprietary leachants and extractants that are non-toxic and said to benefit biological activity are used to selectively extract toxic metals. Leachant and extractant are fully recycled. Sediments from St. Marys River were treated by COGNIS. (Completed June '93)
- ◆ Davy In-Pulp Extraction: Davy International performed bench-scale studies on Hamilton Harbour sediment in an attempt to remove heavy metals. The In-Pulp process uses a variety of acids and metal adsorbents to clean sediment of metals. (Completed Sept. '94)
- ◆ Dearborn Biological Treatment: Grace Dearborn of Mississauga pioneered work on biological treatment of soils and sediments. Dearborn has successfully cleaned sediments from Thunder Bay Harbour and St. Marys River at bench-scale. The process uses patented amending agents and nutrients. (Completed Aug. '94)
- ◆ EcoLogic Thermal "Destructor": Eli EcoLogic Inc. of Rockwood, Ontario has developed a thermal, gas-phase reactor that destroys hydrocarbons and is particularly effective at detoxifying chlorinated compounds. EcoLogic treated sediments from Hamilton, Thunder Bay and Sheboygan Harbours at bench-scale. Excellent results were achieved. (Completed Apr. '91)  
A pilot-scale demonstration of the Ecologic Thermal "Destructor" was also carried out in Hamilton Harbour in 1992. The final report is completed.

- ◆ **EcoLogic Thermal Desorber:** Eli EcoLogic Inc. developed a thermal desorber to complement its thermal destruction reactor. After some process modifications, EcoLogic performed bench-scale tests on Thunder Bay sediment with the desorber. (Completed Oct. '94)
- ◆ **EcoLogic Destructor:** The Eli EcoLogic Inc. technology was tested at bench-scale for its ability to destroy dioxins and furans in sediment. A draft report has been submitted. (Completed Dec. '96)
- ◆ **Ensotech Fixation Process:** Welland River soils and sediments were used in the bench-scale testing of two patented chemicals - "Ensol" and "Landtreat". The chemicals are designed to bind the metals and organics in a non-water soluble form that will not allow them to leach out of the matrix. (Completed Nov. '92)
- ◆ **HRT Fixation:** Pilot-scale tests are being conducted on sediment from Hamilton Harbour to determine the fixation and mineralization capabilities of the HRT Fixatives. (Ongoing)
- ◆ **Institute of Gas Technology Biotreatment:** Hydrocarbon-contaminated sediments from Hamilton Harbour were used in a bench-scale test over a two months period. Bioreaction occurred in small vessels in which a variety of tests involving bioaugmentation and addition of an oxidizing agent were completed. The sediment was initially washed with a solvent/water mixture, and both the wash water and the washed solids were treated in bioreactors. (Completed July '92)
- ◆ **Itorics Metal and Organic Treatment:** The Itorics system is a two-step process developed by the Belgian company, Silt NV. The technology removes metals through an acid wash and then biologically treats organics. Silt NV performed bench-scale studies on Thunder Bay sediment. (Completed March '95)
- ◆ **Reactive Silicate Technologies (SIALLON):** Organics are "fixed" through the application of a mildly acidic emulsifying agent followed by a mildly basic "reactive silicate". The end result is the encapsulation of hydrocarbons within small (2 m) silica shells. (Completed Mar. '93)
- ◆ **Stefan, Robertson and Kirsten Metals Removal:** The firm of Stefan, Robertson and Kirsten developed a metals removal process based on magnetic removal and floatation. SRK performed bench-scale studies on Welland River sediment. The technique did not achieve significant metal reductions, possibly due to interference from an oily fraction in the sediment. (Completed Sept. '94)
- ◆ **Triton/Sonofloc Sonic Flocculation:** Welland River water was used in the bench-scale testing of this Austrian technology. Sound waves are used to drive fine particulate matter towards acoustic nodes, where they agglomerate into "flocs" and settle out of the water. (Completed Sept. '92)
- ◆ **Vitrokele Technology (TALLON):** This technology combined solids classification with metal extraction to form an integrated technology for metal contaminated sediments. The principle of metal extraction is similar to the Metanetix process used in the Toronto pilot-scale demonstration, i.e. acidification to solubilize the metals and use of chelation agents to remove the solubilized metals from solution. (Completed Nov. '93)
- ◆ **Waste Stream Bioremediation:** An innovative bioreactor is used to process high solids slurries. Waste Stream enhances natural biological activity through optimization of nutrient conditions and/or application of their "Bioblend" acclimated bacterial cultures. (Completed Oct. '93)
- ◆ **X\*Trax:** Moderate temperatures are used to vaporize organic contaminants in an oxygen free environment. The desorbed organics are then recovered as a light and heavy oil fraction in condensation columns. The clean gas is recycled for use as the carrier gas. (Completed Mar. '93)

### *1.0.7 Mapping and Monitoring Contaminated Sediments*

Start Date: 1994                      Contact: Norm Rukavina, National Water Research Institute  
Status:      Ongoing                      (905) 336-4880

The Roxann bottom-classification system is an acoustic device used for fast, detailed sediment mapping of complex contaminated sites. Sediment stability, distribution and thickness, are being mapped in the St. Lawrence River, Hamilton Harbour, St. Clair River, St. Marys River and Metropolitan Toronto and Region Areas of Concern. The National Water Research Institute, Ontario Ministry of Environment and Energy, and McMaster University are also funding this project.

### *1.0.8 Accelerated Bioremediation of Contaminated Sediments using A-TAR Technology*

Start Date: 1993                      Contact: Deo Phagoo, Water Technology International Corporation  
Status:      Ongoing                      (905) 336-6478

The ability of thermophilic organisms to degrade toxic contaminants is being demonstrated using the auto-heating thermophilic aerobic reactor (A-TAR). It operates at elevated temperatures (45-65°C) without external heating to provide accelerated biological destruction of hazardous organic compounds. The A-TAR pilot-scale experiments using contaminated sediments from Hamilton Harbour have removed over 95% of total PAHs, 80% of total petroleum hydrocarbons, and about 70% of oil and grease over an eight day reactor retention time, without external heating support. This is a major accomplishment compared to the 50-150 days utilized by current vendors of commercial soil bioremediation technologies. This project is also supported by the Water Technology International Corporation, and the National Biotechnology Strategy Fund.

### *1.0.9 In-Situ Sediment Bioassays*

Start Date: 1992                      Contact: Gail Krantzberg, Ontario Ministry of Environment and Energy  
Status:      Complete                      (416) 314-7973

Due to the unavoidable manipulation of sediment samples for laboratory bioassays, Environment Canada and the Ontario Ministry of Environment and Energy are verifying that the laboratory responses of test organisms reflect conditions in nature where sediment contamination is the principle source of benthic impairment. A more comprehensive understanding of the forces governing benthic community structure and laboratory sediment bioassay endpoints, will assist in developing remediation strategies for sediment. Due to the high costs associated with sediment remediation, laboratory sediment bioassays must provide a realistic indication of conditions *in situ*. Environment Canada's National Water Research Institute, and Ontario Ministry of Environment and Energy also funded this project.

### *1.0.10 Contaminated Sediment Assessment*

Start Date: 1990                      Contact: Trefor Reynoldson, National Water Research Institute  
Status:      Complete                      (905) 336-4692

Biological toxicity tests using four test organisms were conducted to evaluate the effectiveness of sediment remediation techniques. The capability to conduct bioassays on about 100 sediment samples per year was established. Pre- and post-demonstration sediment samples were analyzed and compared to the results from 50 clean sites from around the Great Lakes. Results have shown the importance of carrying out pre-treatment assessment in order to conduct appropriate remediation of contaminated sites. Funding to carry out this project was also received from Environment Canada's National Water Research Institute, Great Lakes Preservation Fund, and the United States Environmental Protection Agency.

### *1.0.11 Contaminated Sediment Geographic Information System*

Start Date: 1990                      Contact: Scott Painter, Environment Canada  
Status:      Complete                      (905) 336-4641

Using data from each of the Areas of Concern, a Geographic Information System (GIS) has been developed to provide a consistent format for logging sediment data. The GIS database will function as an invaluable tool for model development, biological assessment, criteria development, and assessment of remedial measures.



## 1.1 COMBINED SEWER OVERFLOWS (CSO) AND STORMWATER MANAGEMENT

### 1.1.1 Upgrade of Stormwater Best Management Practices Planning and Design Manual

Start Date: 1996                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: New                              (905) 336-6281

The Stormwater Management Practices Planning and Design Manual, released in 1994, provides guidance on the integration of comprehensive resource management planning on a watershed basis with municipal land use planning, use of conservation practices, source control programs, site planning practices and stormwater management practices. This project will upgrade the manual by documenting stormwater treatment facility performance in Ontario and other areas. It will incorporate water quantity, flood and erosion controls and water quality in order to develop application guidelines for retrofit situations. The project is also funded by Ontario Ministry of Environment and Energy.

### 1.1.2 Stormwater Management Criteria for Controlling Stream Channel Erosion

Start Date: 1996                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: New                              (905) 336-6281

Urbanization results in increased surface runoff during storms. High velocity flows associated with this runoff contribute to erosion of the receiving stream channels. Stormwater detention ponds are built to contain some of this flow and reduce the velocity of the runoff discharged to the receiving channels. The success of the ponds in actually controlling erosion has been limited to date since the pond design criteria may not be sufficient. Longer periods of high velocity flows are actually experienced, leading to increased channel erosion. This project will develop a standard methodology for determining erosion control requirements from stormwater detention ponds and scenarios where this methodology can be applied. Partners in the project are the Ontario Ministry of Environment and Energy, Credit Valley Conservation Authority, Metropolitan Toronto and Region Conservation Authority, Grand River Conservation Authority, Ontario Ministry of Natural Resources, and Ontario Ministry of Transportation.

### 1.1.3 Combined Sewer Overflows (CSOs) and Stormwater Management Program

Start Date: 1990                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: Ongoing                      (905) 336-6438

The contamination of water, sediment, and biota, is often due to discharges from point and non-point sources. Included in these sources are wet weather discharges from storm sewers and combined storm and sanitary sewers. The aim of this program is to develop and demonstrate cost-effective techniques, strategies and technologies for the alleviation of wet weather problems. Specific projects that apply to all Areas of Concern follow. Further descriptions can be found in the Thunder Bay, St. Clair River, Detroit River, Hamilton Harbour, Metropolitan Toronto and Region, Bay of Quinte and St. Lawrence River sections of this report. This project is carried out in cooperation with the Ontario Ministry of Environment and Energy, and municipal governments.

#### 1.1.3.1 Stormwater Costing Study (Ongoing)

A project to identify, prioritize and determine costs of stormwater management options for achieving a certain target for solids reduction was initiated in an urbanized subwatershed of the City of Scarborough. A summary report is scheduled for completion in 1997. The City of Scarborough, and Ontario Ministry of Environment and Energy also supported this project.

#### 1.1.3.2 Flow Regulation Technology for Existing Detention Facilities (Complete)

This project assessed the practical application of the HydroSlide Flow Regulator device at a Combined Sewer Overflow (CSO) system in St. Catharines. The device has resulted in more efficient operation of the facility with substantially reduced operation and maintenance requirements. The Ontario Ministry of Environment and Energy, and City of St. Catharines also funded this demonstration.

#### 1.1.3.3 Combined Sewer Overflow Costing Study (Complete)

Control costs were established for the use of storage of combined sewage coupled with central treatment or satellite treatment. Optimum combinations and associated costs were determined for different levels of control. Case studies were conducted in Kingston and St. Catharines. A report with costs for CSO control in AOCs with significant combined sewer overflows (CSOs) (Thunder Bay, Severn Sound, St. Clair River, Detroit River, Niagara River, Metropolitan

Toronto and Region, Hamilton Harbour and St. Lawrence River) is now available. The Ontario Ministry of Environment and Energy also funded this project.

#### *1.1.3.4 Estimate Toxic Loadings from Combined Sewer Overflows (CSOs) and Stormwater (Complete)*

This project developed planning-level estimates of toxic loadings from CSOs and bypasses, as well as stormwater runoff. The first phase report provides estimates of the annual loadings of 26 toxic contaminants in urban stormwater runoff, CSOs, and sewage treatment plant (STP) effluents from 239 Ontario communities. Forty-seven of these communities are located in the 17 Canadian AOCs. The phase II report consists of an AOC-specific summary and compilation of results.

#### *1.1.3.5 Feasibility and Cost of Retrofitting to Step Feed (Complete)*

One option to reduce the occurrence of treatment bypasses caused by storm flows is Step Feed Control. This method has been demonstrated at small and large municipal sewage treatment plants (STPs). Step feed operation is being considered as a control strategy, part of the Ontario Ministry of Environment and Energy's position on control of CSOs. The technical and economic feasibility of retrofitting existing municipal STPs for step feed operation was examined; it included a verified methodology for estimating the storm flow capacity of existing STPs retrofitted to step feed operation. The Ontario Ministry of Environment and Energy also funded this project.

#### *1.1.3.6 Flow Measurement Conformance (Complete)*

The need for accurate measurement of flow rate is an essential component of virtually every aspect of water pollution prevention and control. This project established acceptable protocols for evaluating the conformance of flow measurement installations in the field. The use of such conformance protocols to consistently achieve the accuracy limits for installed instrumentation was demonstrated, and different methodologies for applicability, ease of use and accuracy were evaluated. The Regional Municipality of Niagara initiated and carried out this project at its existing STPs with assistance from Ontario Ministry of Environment and Energy, and Great Lakes 2000 Cleanup Fund.

### *1.1.4 Evaluation of New Urban Stormwater Treatment Technologies*

Start Date: 1995                      Contact: W. Edgar Watt, Queen's University  
Status: Ongoing                      (613) 545-2122

This project is investigating the feasibility of innovative physical and biological processes for the treatment and control of urban stormwater. **The primary physical process is enhanced settling of contaminated solids by evaluation of existing baffles in a stormwater pond to increase hydraulic residence time.** The primary biological process uses a biofilm reactor (adjacent to the pond) to remove biodegradable soluble materials, and a constructed wetland. Partners in this project include Environment Canada's National Water Research Institute, Ontario Ministry of Environment and Energy, and Queen's University.

#### *1.1.5 Constructed Wetlands for Stormwater Management*

Start Date: 1995                      Contact: George Mulamootil, University of Waterloo  
Status: Ongoing                      (519) 888-4567 ext 2145

The use of constructed wetlands to remove pollutants from stormwater is becoming an attractive option for municipalities. One difficulty is the inability to maintain year-round operation because of winter conditions. This project will evaluate the feasibility of a greenhouse cover over a constructed wetland. This cover would allow the plants to maintain a base level of growth, and hence, be ready for pollutant uptake during spring runoff conditions. Performance evaluation of the greenhouse wetland and the control (uncovered) wetland, started in 1996. Other partners in this project include the Ontario Ministry of Environment and Energy, University of Waterloo, and Town of Aurora.

#### *1.1.6 Treatability, Characterization and Toxicity of CSOs and Stormwater*

Start Date: 1994                      Contact: Jiri Marsalek, National Water Research Institute  
Status: Ongoing                      (905) 336-4899

Standard chronic and acute toxicity tests, as well as less conventional, cheaper and faster, rapid test bioassays are being applied to combined sewer overflows (CSOs) and stormwater samples. Some of these samples have undergone treatment, such as settling in stormwater ponds and high rate treatment. Preliminary results from the rapid bioassay tests indicate that highway runoff samples appear to be the most toxic, while stormwater was more toxic than CSOs. This

project is also supported by Environment Canada's National Water Research Institute, Ontario Ministry of Environment and Energy, City of Toronto, City of Etobicoke, and City of Scarborough.

#### *1.1.7 Workshop on Stormwater Best Management Practices*

Start Date: 1996                      Contact: Jiri Marsalek, National Water Research Institute  
Status: Complete                      (905) 336-4899

On October 16 and 17, 1996, a workshop and short course, entitled "Controlling Stormwater - 2001 and Beyond", was attended by 175 participants from RAP areas, municipalities, consulting industry, conservation authorities, federal and provincial agencies. Information on the latest advances in stormwater management (including results and status of various Great Lakes 2000 Cleanup Fund supported projects) was disseminated. Interactive discussions on current issues to resolve in stormwater management were also held. Partners included Queen's University, National Water Research Institute, Metropolitan Toronto and Region Conservation Authority, and Ontario Ministry of Environment and Energy.

#### *1.1.8 Special Issue of Water Quality Research Journal of Canada*

Start Date: 1995                      Contact: Jiri Marsalek, National Water Research Institute  
Status: Complete                      (905) 336-4899

Great Lakes 2000 Cleanup Fund projects related to the management of stormwater and combined sewer overflows were profiled in a special issue of the Water Quality Research Journal of Canada, to be released in early 1997. Environment Canada's National Water Research Institute also participated in this effort.

#### *1.1.9 Removal of Contaminants by Stormwater Ponds*

Start Date: 1992                      Contact: Jiri Marsalek, National Water Research Institute  
Status: Complete                      (905) 336-4899

Stormwater ponds have been traditionally designed to control flooding rather than to remove pollutants. In this project, a conventionally-designed stormwater pond was evaluated to determine the extent of pollutant removal. Detailed velocity measurements and simulation using a computer model of the pond identified severe short-circuiting that resulted in low residence times for the settling of solids. The pollutant performance was substantially improved by installing baffles which slowed down the flow and provided more time for settling of solids and associated contaminants. The optimum design and location of the baffles was calculated using the computer model. Our partners in this project are Queen's University, Ontario Ministry of Environment and Energy, Kingston Township, and Environment Canada's National Water Research Institute.

#### *1.1.10 Municipal Sector Toxics Reduction*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

This project helped to develop a sophisticated computer-based model called TOXCHEM. Using a database of over 100 metals and organic contaminants, the software predicts the ultimate fate of any contaminant within a sewage treatment process as a function of design or operating changes. The model can also predict the fate of the contaminant along the sewer system. The software is now a commercial product available from a Hamilton-based company.

## **1.2 MUNICIPAL AND INDUSTRIAL WASTEWATER TREATMENT**

#### *1.2.1 Simulation Model for Small Sewage Treatment Plant Optimization*

Start Date: 1996                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: New                              (905) 336-6281

For large sewage treatment plants (STPs), the process audit tool has been successful in optimizing equipment and costs required to meet RAP effluent targets. However, for small STPs, conducting a process audit is difficult since a critical element of the audit, known as stress testing, cannot be carried out due to a lack of duplication of key process equipment (i.e. aeration basins and settlers). Simulation models may overcome this limitation. Hence, this project will evaluate a selected computer model to determine its role in calculating extra treatment capacity for small STPs. Partners in this project are the Ontario Ministry of Energy and Environment, and McMaster University.



### *1.2.2 Toxicity of Disinfected Effluents*

Start Date: 1996                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: New                              (905) 336-6281

This project will assess the changes in chronic/sublethal toxicity in municipal STP effluents after disinfection using conventional methods (chlorination-dechlorination) and more increasingly-used methods (medium pressure-high intensity ultraviolet (UV) irradiation, low pressure - low intensity UV irradiation). Three samples (of an expected total of 10) of non-disinfected and disinfected sewage have been analysed to date. Partners are the Ontario Ministry of Energy and Environment, and Environment Canada's National Water Research Institute.

### *1.2.3 Biomixer Aeration Device for Optimum Nitrification of Sewage*

Start Date: 1996                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: New                              (905) 336-6281

Nitrification of sewage effluents removes ammonia which is toxic to fish. For effective nitrification, more air must be supplied to the treatment process; this could be costly and certain systems (e.g. fine pore bubble diffuser) may lack flexibility, once installed. The biomixer aeration device consists of a self contained, easily installed unit which provides flexibility for air supply and distribution during STP operation. The unit is being evaluated at the Dundas STP and then at the Woodward Ave. STP where one of the long-term RAP targets is enhanced nitrification. Partners include the Regional Municipality of Hamilton-Wentworth, Phillips Utilities Management Corp., and Biomixer Inc..

### *1.2.4 Moving Bed Bioreactor for Nitrification of Sewage*

Start Date: 1996                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: New                              (905) 336-6281

Nitrification of sewage effluents removes ammonia which is toxic to fish. Conventional design approaches for existing sewage treatment plants to meet nitrification requirements are costly. A cheaper approach is being developed under this project. It is based on increasing the surface area of the biological reactor by packing the existing reactor vessels with small plastic blocks. More surface area will be provided for the biomass responsible for treatment, thus eliminating the need for the more costly provision of additional tanks. Laboratory tests are being conducted in 1996/97 with field trials scheduled to start in 1997/98 at the Waterdown STP. Partners are Environment Canada's Environmental Technologies Advancement Directorate, and Ontario Ministry of Environment and Energy.

### *1.2.5 Sewage Treatment Plant (STP) Optimization Program*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Ongoing                      (905) 336-6281

It has been estimated that a cost saving of \$125 million in upgrading municipal sewage treatment plants (STPs) in Canadian AOCs can be realized by the application of optimization approaches. STPs have been selected for the demonstration of innovative approaches and technologies for improving plant performance at the most economical cost. Innovative approaches and technologies include: i) developing and evaluating computer-based models to design, predict performance and improve reliability of designing retrofits; ii) gaining better understanding of contaminant removal and ultimate fate; iii) determining conditions for phosphorus removal using chemical precipitation and tertiary filtration; iv) evaluating low-cost technologies for removal of ammonia toxicity, and v) training and technology transfer to STP personnel. Implementing these strategies will substantially reduce the loading of ammonia, phosphorus, heavy metals, and toxic organic contaminants to AOCs. Specific projects for AOCs can be found in the Bay of Quinte, Collingwood Harbour, Detroit River, Hamilton Harbour, St. Clair River, Niagara River, Severn Sound, Spanish Harbour and Metropolitan Toronto and Region sections. The following projects applicable to all AOCs have been initiated.

#### *1.2.5.1 STP Optimization - Municipal Assistance Program (Complete)*

One aim of the STP optimization program is to transfer the techniques of optimization to regulatory and funding bodies so that there is a consistent interpretation of the results when these personnel are approached with funding proposals for optimization. This technique stresses proper process control and accountability of the biomass sludge. The reason for the sludge accountability exercise is to determine if excessive solids are being released in the effluent because sludge is not being more frequently pumped out of the treatment train. Training was provided to a team from the Ontario Ministry

of Environment and Energy District/Regional offices and the Ontario Clean Water Agency's Municipal Assistance Program. The project was conducted at the Napanee STP in the Bay of Quinte.

#### *1.2.5.2 Audit of Biosolids Handling Processes at Municipal Sewage Treatment Plants (Ongoing)*

This project will identify the factors that limit the performance of biosolids handling processes in municipal sewage treatment plants in Ontario. These factors will be prioritized and optimization options, considering the costs and performance of biosolids handling processes, will be developed. Work conducted to date included: a workshop to identify the research needs for biosolids handling, conducting a survey of sludge handling facilities to determine key operating difficulties, and the first phase of a sampling program at representative municipal STPs. This project is also funded by the Ontario Ministry of Environment and Energy, and Water Environment Association of Ontario.

#### *1.2.5.3 STP Optimization Training and Technology Transfer (Complete)*

One aim of the STP optimization program is to transfer the optimization techniques to consultants and STP personnel so that there is a consistent approach in applying the techniques. Project accomplishments include the publication of a guidance manual on process audits (one tool used in process optimization), and documents targeted at managers and operators of STPs on how to conduct plant optimization. Three workshops were held in London, Toronto and Kingston to transfer the information in these documents. This project was also funded by the Ontario Ministry of Environment and Energy.

#### *1.2.5.4 STP Optimization for Federal Facilities in the Great Lakes Basin (Ongoing)*

This project provides training and technical assistance to optimize STPs at federal facilities, such as Canadian Forces Bases. STP optimization work was conducted at CFB Trenton and Warkworth Correctional Institution in the Bay of Quinte AOC, Joyceville Correctional Institution in the St. Lawrence River AOC and CFB Borden in the Severn Sound AOC.

#### *1.2.5.5 Optimization of Tertiary Treatment Operations (Complete)*

Several RAP teams have identified the need to reduce phosphorus in municipal wastewaters to extremely low levels (i.e. 0.1 mg/L). In most cases, the proposed effluent qualities cannot be met by conventional secondary treatment involving chemical addition. Tertiary treatment will be very expensive if conventional design practices are adopted. Additionally, the ability of these units to achieve this goal has not been demonstrated. Appropriate operating strategies for several pilot and full-scale tertiary filtration operations in Ontario were evaluated and identified. This project was cooperatively undertaken with the Ontario Ministry of Environment and Energy, Environment Canada's Environmental Innovation Program and Technology Development Directorate, and the Regional Municipality of Halton.

#### *1.2.5.6 Evaluation of Ultraviolet Disinfection under Variable Loading (Complete)*

A detailed investigation of the ultraviolet (UV) disinfection system at the Windsor Little River municipal sewage treatment plant was undertaken, both to identify the variables affecting the bacterial quality of the final plant effluent and to determine the effectiveness of current UV disinfection practices during periods of variable loading. Existing design practices were found to be adequate in providing UV disinfection of final plant effluent under all plant conditions normally encountered. Changes in diurnal flow patterns did not affect the efficiency of the disinfection system and, with a few infrequent exceptions, effluent samples easily met the discharge limits specified for the plant. The final report has been published.

#### *1.2.5.7 STP Non-Compliance Evaluation (Complete)*

Several municipal STPs in Ontario regularly exceed the guidelines for total suspended solids (TSS) and biochemical oxygen demand (BOD) in effluent. A standard procedure was developed for identifying the reasons for TSS and BOD non-compliance at STPs. Performance evaluations were then conducted at three STPs to assess the protocol's ability to identify the factors which limit the performance of STPs. Finally, technical assistance was provided to STP staff to upgrade operations and document practices in site-specific Operations Manuals. A guidance manual was prepared to assist operating agencies in developing and applying site-specific Operations Manuals.

#### *1.2.5.8 Removal of Phosphorus and Ammonia from Lagoon Effluent (Complete)*

In several AOCs, stringent phosphorus limits have been established by RAP Teams. In Severn Sound and Bay of Quinte, there are numerous lagoon systems used to treat sewage from smaller communities. These lagoon systems do not have acceptable phosphorus removal facilities. In addition, because the lagoons are operated seasonally and their retention times are insufficient for nitrification to occur, ammonia and hydrogen sulphide levels are likely to be toxic. A

promising option to alleviate both of these problems has been identified at the New Hamburg STP, where the lagoon effluent is treated by "intermittent" sand filtration. The success of this technique and its applicability to other AOCs was verified. Several municipalities have since adopted the technology. Environment Canada's Technology Development Directorate, and Ontario Ministry of Environment and Energy also funded this project.

#### *1.2.5.9 Treatment and Disposal of Sludge from STPs with Low Effluent TP Requirements (Complete)*

A focus for several AOCs will be removal of total phosphorus (TP) from STP effluent to levels of 0.10 - 0.32 mg/L. To achieve the low levels of phosphorus, metal salts, coagulants and their associated heavy metal contaminants will be added to the sewage. Since sludge production may increase, current treatment and disposal methods may be affected. This project determined that while the mass of sludge may increase by approximately 20%, sludge volumes will not be increased.

#### *1.2.6 Treatment of Pulp and Paper Wastewater*

Start Date: 1991                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

Wastewater from pulp and paper mills results in significant water quality impairments in many AOCs. A laboratory-scale study of anaerobic treatment of segregated kraft bleach plant wastewaters was conducted. Activated sludge and aerated stabilization basin treatment of bleached whole mill wastewater, were also evaluated. Partners include the Water Technology International Corporation, Panel on Energy Research and Development, and Ontario Ministry of Environment and Energy.

#### *1.2.7 Iron and Steel Effluent Treatment*

Start Date: 1991                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

The iron and steel industries have an impact on several AOCs. The feasibility of upgrading filtration and developing pre- or post-treatment operations to improve effluent quality from iron and steel mills, was evaluated at Dofasco in Hamilton. The goal was to achieve optimum removal of solids, cyanide and polycyclic aromatic hydrocarbons (PAHs). A series of draft reports were prepared in 1992. The Water Technology International Corporation, and Ontario Ministry of Environment and Energy also funded this project.

### **1.3 FISH AND WILDLIFE HABITAT REHABILITATION**

#### *1.3.1 King Rail Recovery Survey*

Start Date: 1996                      Contact: Dave McLachlin, Ducks Unlimited Canada  
Status: New                              (705) 721-4444

This project will develop a survey program for Ontario using the St. Clair Marsh as the prototype. It will initiate the survey of all known historic and potential King Rail breeding sites, collect productivity data, provide a summary of habitat requirements, and quantitatively describe breeding habitat, vegetation structure of breeding habitat, water depths and duration of flooding of known breeding sites. It will also identify key breeding sites and map critical habitat. Project partners include Environment Canada's Canadian Wildlife Service, Ontario Ministry of Natural Resources, Long Point Bird Observatory, Ducks Unlimited Canada, Endangered Species Recovery Fund, and Walpole Island Heritage Centre.

#### *1.3.2 Temperate Wetlands Restoration Workshop*

Start Date: 1995                      Contact: Jim Atkinson, Ontario Ministry of Natural Resources  
Status: Ongoing                      (705) 755-1801

Wetland rehabilitation and protection is an important priority of the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem. Wetland restoration is needed to replenish degraded areas and prevent a net loss of wetlands in developing areas. A workshop was held to synthesize existing knowledge and information about the science of wetland rehabilitation. Wetland researchers and managers were invited to submit expert knowledge to develop the best approaches to wetland rehabilitation. These approaches will be synthesized and made available to wetland rehabilitation practitioners and project managers throughout the Great Lakes Basin. Management strategies to identify major perturbations to wetlands, along with a decision making process will be developed; restoration which enhances,



rehabilitates, recreates and/or repairs wetland function will be identified. A training manual containing the technical guidelines for the restoration of Great Lakes Basin wetlands will be produced. Partners in this project include Environment Canada's Canadian Wildlife Service, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ducks Unlimited Canada, North American Wetland Conservation Council, Trent University, Wildlife Habitat Canada, and workshop participants.

### *1.3.3 Restoring Breeding Populations of Raptors*

Start Date: 1994                      Contact: Chip Weseloh, Environmental Conservation, Environment Canada  
Status: Ongoing                      (416) 739-5846

This project will facilitate restoration of viable, self-sustaining breeding populations of ospreys, bald eagles, and peregrine falcons along the shorelines of the Great Lakes. The bald eagle is likely to be proposed by U.S. and Canadian governments as an indicator species in the Great Lakes basin. In areas where bald eagles do not yet occur, ospreys and peregrine falcons are useful surrogate indicators of ecosystem health. In 1993, 21 osprey and two bald eagle platforms were installed in prime locations along the shores of Lake Erie, Lake Ontario, and southern Georgian Bay. By June 1994, at least three osprey platforms and one bald eagle platform had been occupied. In 1995, 21 peregrine falcon nest-boxes were installed. A manual describing the construction of artificial nest structures for ospreys was prepared and distributed and is still being requested from around the world. Up to 2 more artificial bald eagle nesting platforms, 5 peregrine falcon nest-boxes and 3 nest-trays will be installed. Monitoring of reproduction and occupancy at the artificial nesting platform site, nest boxes and trays will continue. Long-term assessment of osprey population parameters will be pursued to establish whether contaminants are still impacting survival or recruitment. Remote-controlled video cameras were installed at occupied nesting ledges or boxes in cities for public viewing in building lobbies and relay to TV stations. Environment Canada's Environmental Conservation Branch EcoAction Program, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Provincial Environmental Youth Corp., City of Oshawa, City of Scarborough, Heritage Canada - St. Lawrence Islands National Park, Halton Region Conservation Authority, Bay of Quinte RAP Team, World Wildlife Fund, Federation of Ontario Naturalists, Thunder Bay Field Naturalists, Kingston Field Naturalists, McIlwraith Field Naturalists, Hamilton Naturalists, Sault Naturalists, Long Point Bird Observatory, Georgian Bay Osprey Society, Kawartha Lakes Osprey Society, Toronto Ornithological Club, Toronto Humane Society, Hawk Cliff Raptor Station, Royal Botanical Gardens, Environment North, Leeds Anglers and Hunters, New York DEC, Michigan Department of Natural Resources, Wisconsin Peregrine Society, Ontario Hydro, Cornwall Hydro, Air Canada, General Motors of Canada Ltd., Canada Trust - Friends of the Environment, Upper Canada Management Ltd. Etobicoke Building Management Ltd, The Horizon Group, Hiram-Walker Ltd., Cargill Ltd. (Samia), Mark Nash, Ogilvie Mills Ltd, E.B. Eddy Forest Products, Falconbridge Mining Co., Stelco Inc., Sheraton Hotel (Hamilton), Princess Margaret Hospital, Intercon Security, Canada Life, Standard Life Assurance Co., and volunteers are supporting this project.

### *1.3.4 Wildlife, Habitat, and Wetlands Project Coordination*

Start Date: 1993                      Contact: Nancy Patterson, Environment Canada  
Status: Ongoing                      (416) 739-5824

In order to restore beneficial uses in the Great Lakes basin, this project is providing a coordinated approach to ensure that wildlife needs are well expressed in all Great Lakes 2000 Cleanup Fund habitat projects. A multi-stakeholder approach, similar to that in AOCs, is being applied to other priority areas. Specific projects include the delivery of an ecological monitoring protocol, habitat rehabilitation demonstrations for non-game species, a fact sheet on carp control, and a fish and wildlife habitat rehabilitation newsletter. A work document entitled: "Identifying Habitat Rehabilitation Targets and Priorities in the Great Lakes Area of Concern: Upland Systems" was finalized; aquatic targets currently being prepared through OMNR will be tested in 1996/97. The Wildlife Watchers Program has been developed to bring together many of the volunteer monitoring and conservation programs in the province, and to provide feedback and recognition to participants. A Marsh Monitoring Program (MMP) monitored marsh birds and amphibians in all 43 Canadian and U.S. Areas of Concern. Management plans have been prepared for the 157.2 ha of provincially significant Butternut Creek Swamp Forest and for the 31.3 acre Long Point Bird Observatory Starling Property. Through this initiative, the extent of productive aquatic habitats will be increased through rehabilitation and protection of 6,000 ha of wetland habitat and 600 km of riparian habitat. This project is also supported by Environment Canada's Environmental Conservation Branch, EcoAction and Action 21, Department of National Defense, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Great Lakes Protection Fund, Regional Municipality of Niagara, Tay

Township, Niagara Region Conservation Authority, Metropolitan Toronto and Region Conservation Authority, Environment Network (Collingwood RAP), Long Point Conservation Authority, Ducks Unlimited Canada, Long Point Bird Observatory, and numerous volunteers.

### *1.3.5 Fish and Wildlife Habitat Best Management Practices*

Start Date: 1995                      Contact: Kevin Loftus, Ontario Ministry of Natural Resources

Status:     Complete 1996                      (705) 755-3202

This project produced a booklet as part of an Agricultural Best Management Practices series, that explains how to restore, maintain or enhance wildlife habitats on rural property, providing measures that preserve soil and water quality, allowing agriculture and wildlife to co-exist. The book was launched with a media release in May 1996. A survey indicated that over 80% of the farmers were familiar with at least one of the books in the Series, and two-thirds of those familiar with the book had implemented changes in their operation as a result of the information provided in the books. Environment Canada's Environmental Conservation Branch, Agriculture Canada, Ontario Ministry of Natural Resources, Ontario Ministry of Agriculture, Food and Rural Affairs, Ontario Federation of Agriculture, Ontario Soil and Crop Improvement Association, Ducks Unlimited Canada, Wildlife Habitat Canada, Eastern Habitat Joint Venture, Ontario Federation for Anglers and Hunters, and Private Forests Sustainability Fund are also supporting this project.

## **1.4 COMMUNICATIONS**

### *1.4.1 Underwater Video in Support of Habitat Education and Scientific Assessment*

Start Date: 1996                      Contact: Hans Biberhofer, Environmental Conservation Branch

Status:     New                                      (905) 336-4512

Through this initiative a digital camcorder and related hardware will be purchased and set-up to film underwater real-time transmission of scientific activities to schools, local cable television networks, or other institutions, for education, outreach, scientific assessment and archival purposes. Processing of the camera's output will enable the provision of digital images which can be transmitted via e-mail, inserted into a document or included as part of a web site. The set-up would be carried out to enable highlighting progress of Great Lakes 2000 Cleanup Fund projects; for example the artificial reefs constructed in the St. Lawrence RAP provide new and improved habitat for a number of aquatic fauna. The system will also be set-up as to provide a telephone link, giving students the opportunity to directly ask questions to the divers who could then respond through surface linked communications to the students and use the camera to provide highlights or examples in response to the questions.

### *1.4.2 GLCUF / Action 21 Habitat Workshop*

Start Date: 1996                      Contact: John Shaw, Great Lakes 2000 Cleanup Fund

Status:     New                                      (905) 336-6273

One of the commitments under the Canada-Ontario Agreement Respecting the Great Lakes Basin Ecosystem (COA) is to increase the extent of productive aquatic habitats in the Great Lakes basin ecosystem, including Areas of Concern, by rehabilitating and protecting 6000 ha of wetland habitat and 600 km of riparian habitat. A joint Great Lakes 2000 Cleanup Fund and Action 21 workshop entitled, "Sharing Experiences in Habitat Rehabilitation" was held on March 7 and 8, 1997. The workshop brought together practitioners involved in wildlife and habitat rehabilitation in the Great Lakes basin. The intent of the workshop was to showcase various projects, provide information on future directions for habitat-related funding priorities, promote technology transfer, share expertise, provide an opportunity for networking and encourage innovative fundraising approaches.

### *1.4.3 Great Lakes Alive - Phase II*

Start Date: 1995                      Contact: Maureen Martinuk, Environment Canada

Status:     Complete                                      (416) 739-4787

This project will produce the second segment of the successful and popular Great Lakes Alive series for broadcast on TV Ontario. This second documentary will be called *Restoring the Balance*. Health Canada, Fisheries and Oceans Canada, Agriculture and Agri-Food Canada, Transport Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Laidlaw Foundation, McLean Foundation, George Lunan Foundation, and George Gund Foundation (U.S.) are also funding this project.

#### *1.4.4 Tern Communications*

Start Date: 1995                      Contact: Hans Blokpoel, Environment Canada  
Status:     Ongoing                      (613) 952-2410

Various projects to provide alternate habitat for declining tern populations are underway in the Bay of Quinte, Hamilton Harbour and Metropolitan Toronto and Region AOCs. Rafts of varying sizes are used for different species. The results of these projects will be shared by producing a fact sheet on the Terns of the Canadian Great Lakes, a video and technical manual on the use of reeфраts to improve aquatic habitats, and a fact sheet on Caspian Tern use of rafts, as well as, publishing a report on colonial waterbirds nesting in Hamilton Harbour. Partners in this project include Hamilton Harbour, Metropolitan Toronto and Bay of Quinte RAPs, Metropolitan Toronto and Region Conservation Authority, and Geomatics International.

#### *1.4.5 Workshops and Conferences*

Start Date: 1995                      Contact: John Shaw, Great Lakes 2000 Cleanup Fund  
Status:     Ongoing                      (905) 336-6273

The Great Lakes 2000 Cleanup Fund supported a number of workshops and conferences in 1995/96, including **Sediment Remediation '95**, the **Water Pollution Research Symposium**, **Canadian Water Resources Association's Watershed Management Symposium**, and the **North American Lake Management Society's Lake Management Conference**. By supporting these activities, the Great Lakes 2000 Cleanup Fund communicates its results and allows RAP input. Partners include Environment Canada's National Water Research Institute and Environmental Conservation Branch, Ontario Ministry of Environment and Energy, Canadian Association of Water Quality Managers, and United Nations Environmental Program.

#### *1.4.6 Keys to the Watershed - Turning Decisions into Results*

Start Date: 1994                      Contact: Mary Sontag, Erie County  
Status:     Complete                      (716) 858-7762

In June 1995, an international symposium was held to discuss the use of the ecosystem approach for watershed management. A guidance document was developed showcasing the many successes implemented throughout the Great Lakes Basin.

#### *1.4.7 Yellow Fish Road Storm Drain Marking Program*

Start Date: 1993                      Contact: Colleen O'Meara, Fisheries and Oceans Canada  
Status:     Ongoing                      (905) 336-6240

This public awareness/community participation program is designed to stop the indiscriminate dumping of unwanted industrial and household products down the drain and into stormwater. By communicating the harmful effects of substances such as used oil, paint, pesticides, antifreeze and cleaning agents, which are often poured down storm drains, it is hoped that this project will encourage householders to properly dispose of hazardous wastes. Volunteers paint a yellow fish symbol near storm drains in their neighbourhoods and distribute information to discourage indiscriminate dumping of hazardous material in these drains. Efforts have been made to focus the program on the Great Lakes Basin, and RAP municipalities in particular. The Yellow Fish Road program has been featured during National Wildlife Week at the CN Tower EcoDeck and is also being used in display presentations at the Metropolitan Toronto Zoo. Activities are continuing. Partners in this venture are Environment Canada, Fisheries and Oceans Canada, Health Canada, Agriculture and Agri-Food Canada, Transport Canada, Regional Municipality of Metropolitan Toronto, Credit Valley, City of Oshawa, Grand River Conservation Authorities, Metropolitan Toronto and Region and St. Clair River RAPs, Trout Unlimited Canada, and Philip Environmental.

#### *1.4.8 The Big Flush - An Educational Video about Sewage Issues*

Start Date: 1993                      Contact: John Shaw, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6273

"The Big Flush" is an educational video intended to raise public awareness of the impact of daily human activities on the environment. By using sewage as a relevant and recognizable issue, young people's interest in science, technology and environment will be stimulated. Conventional methods of sewage treatment were contrasted with alternative.



ecologically-based systems, and the underlying differences in philosophy between the two approaches were examined. The script for the video was completed. This project was also supported by Merlan Scientific, and Photosynthesis Productions.

#### *1.4.9 Interactive Computer Software for Remedial Action Plans (RAPs)*

Start Date: 1993                      Contact: Colleen O'Meara, Fisheries and Oceans Canada  
Status:     Complete 1995                      (905) 336-6240

An interactive computer software package for use by RAPs was designed through this initiative. The software will provide the public with an introduction to the RAPs, raise awareness of activities being undertaken in local communities, provide feedback of audiences' knowledge, and encourage public involvement in cleaning up our waterways. The CD-ROM that includes a multiple choice quiz about each of the Canadian AOCs has been completed and reproduced into 100 copies. The packages have been distributed to RAP coordinators to be demonstrated and updated. They were also distributed to public education organizations such as the Ontario Science Centre, Science North, CN-Tower, EcoDek. Copies will be made available to local schools, shopping malls, public libraries, community events, and environmental shows. Fisheries and Oceans Canada, Health Canada, Environment Canada's Communications Branch, and Ontario Ministry of Environment and Energy have also supported this project.

#### *1.4.10 Homes for Fish Colouring Book*

Start Date: 1993                      Contact: Colleen O'Meara, Fisheries and Oceans Canada  
Status:     Complete                      (905) 336-6240

Five hundred copies of the "Homes for Fish", fish and wildlife habitat colouring book were distributed to each RAP coordinator. The books will educate children about how they can help protect and improve water quality and fish habitat. Schools and youth groups in RAP areas can use the booklet to introduce the topic of the aquatic environment as part of an environmental education program. Environment Canada, Fisheries and Oceans Canada, and Ontario Ministry of Environment and Energy also funded this project.

#### *1.4.11 Aquatic Habitat Awareness*

Start Date: 1994                      Contact: Tammara Boughen, Environment Canada  
Status:     Complete                      (416) 739-5827

An educational insert to "Owl Magazine" addressing the importance of freshwater aquatic habitats to fish and wildlife was developed. This initiative informed a young audience (ages 8 and up) of the intrinsic value of aquatic habitat and of the importance of protecting and conserving natural habitat. Partners included Environment Canada's Environmental Conservation Branch, Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Owl Communications Ltd., and Philip Environmental.

#### *1.4.12 Inventory of Federal Facilities in Areas of Concern (AOCs)*

Start Date: 1992                      Contact: Lawrence King, Environmental Protection Branch, Environment Canada  
Status:     Complete                      (613) 952-8679

The federal government is a significant property owner and lease-holder within the Great Lakes Basin. To varying degrees there is a federal component within each AOC. This project has defined the federal component within four AOCs (Bay of Quinte, Collingwood Harbour, Hamilton Harbour and Severn Sound). The Thunder Bay, Metropolitan Toronto and Region and Niagara River AOCs have also been investigated and reports are being prepared. Federal liability, in terms of pollution sources and gaps in existing remedial and preventative programs, will be determined in order to guide future efforts by facility owners towards remediation. If successful, the program will continue to document each of the 17 AOCs. Environment Canada's Environmental Protection Branch and Canada's Green Plan also funded this project.

#### *1.4.13 Pollution Prevention Strategy*

Start Date: 1990                      Contact: Tom Tseng, Environmental Protection Branch, Environment Canada  
Status:     Complete                      (416) 739-5853

This strategy provides a comprehensive, sustainable approach for the restoration and maintenance of the integrity of the Great Lakes ecosystem by building upon and complementing current remedial activities and regulatory/legislative control frameworks of both the United States and Canada through the adoption of preventative approaches

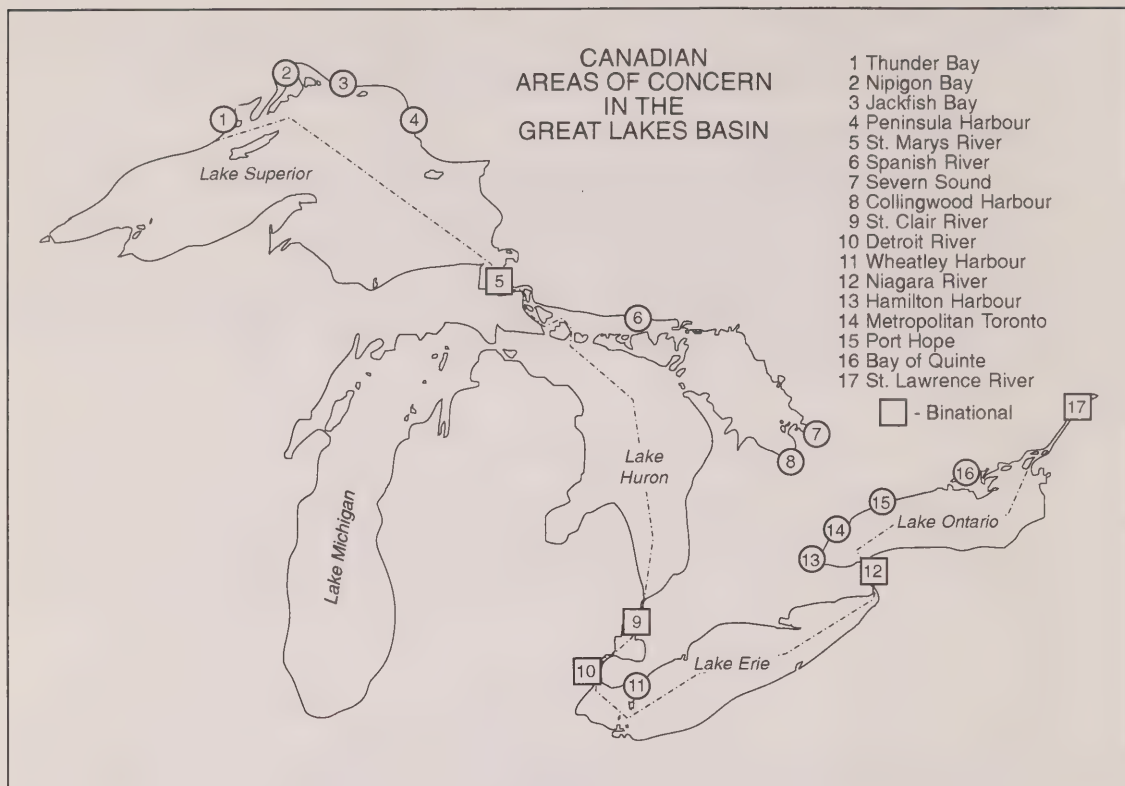
### **1.5 RURAL NON-POINT SOURCE (NPS) PROJECTS**

#### *1.5.1 Agricultural NPS Remediation Strategies - Guidelines for RAPs*

Start Date: 1992                      Contact: John Shaw, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6273

Five Great Lakes AOCs receive significant contamination from agricultural sources. Guidelines to assist the RAPs in remediating agricultural sources of pollution have been developed using the "*Bay of Quinte Agricultural Diffuse Source Control Strategy*" as a demonstration. Other AOCs and agencies have been consulted, to assist with the development of remedial strategies using these guidelines.

## PART II - PROJECTS SPECIFIC TO A LAKE OR AREA OF CONCERN





## 2.1 LAKE SUPERIOR PROJECTS

There are four Canadian Areas of Concern (AOCs) on Lake Superior - Thunder Bay, Nipigon Bay, Peninsula Harbour, and Jackfish Bay - plus one at the outlet - St. Marys River. The Great Lakes 2000 Cleanup Fund has funded projects in each of these AOCs, as well as, a number of projects which support remediation in Lake Superior as a whole

### SEDIMENT REMEDIATION

#### *2.1.1 In-Place Treatment of Contaminated Sediments*

Start Date: 1991                      Contact: Tom Murphy, National Water Research Institute  
Status: Complete                      (905) 336-4602

Treating contaminated sediments in-place is being demonstrated as a potentially less expensive alternative to removal. Environment Canada's National Water Research Institute has developed and is demonstrating this technique. Sediment toxicity is being treated in-place by injecting an oxidant into the sediment (either ferric chloride or calcium nitrate). Addition of the oxidant reduces the acute toxicity of the sediment and enhances bioremediation of organic contaminants in the sediment. The technique has been tested in St. Marys River and Hamilton Harbour. Positive results have been obtained in St. Marys River although long-term monitoring is still being carried out. The technique has also been tested at Laboratory scale using sediment from the Nipigon Bay AOC. Other collaborators include Environment Canada's National Water Research Institute, Great Lakes Preservation Fund, Ontario Ministry of Environment and Energy, Dofasco Inc., Stelco Inc., and Golder Associates.

(Also refers to sections 2.3.1, 3.01 & 10.1.7)

### SEWAGE TREATMENT PLANT OPTIMIZATION

#### *2.1.2 Integrated Water Supply and Treatment Alternatives*

Start Date: 1995                      Contact: Ken Cullis, Lake Superior Programs Office  
Status: On hold                      (807) 768-1826

In both Nipigon Bay and St. Marys River AOCs, significant infrastructure investment is required for both water supply and wastewater treatment. This project will develop an integrated strategy that takes advantage of potential efficiencies and ensures that the system is managed in a comprehensive, effective, reliable and ecosystemic fashion. Options will be developed for the Nipigon Water Treatment Plant, Nipigon Sewage Treatment Plant, Red Rock Sewage Treatment Plant, and East End Sewage Treatment Plant in Sault Ste. Marie. Domtar Packaging, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ontario Ministry of Northern Development and Mines, Ontario Clean Water Agency, Town of Nipigon, Town of Red Rock, City of Sault Ste. Marie, Environment Canada, and Red Rock Indian Band are also supporting this project.

(Also refers to sections 2.3.3 & 3.0.4)

### HABITAT REHABILITATION

#### *2.1.3 Evolution of Waterfront Restoration Strategies*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

The St. Marys, Thunder Bay and St. Louis River (U.S.) AOCs are addressing similar issues of degraded waterfront habitat and concerns for future waterfront development. A two-day workshop was held to bring together interested representatives from municipal agencies and organizations. Proceedings from the workshop will be completed and released. Restoration strategies for the three largest urban centres on Lake Superior will be linked through partnerships and pooling of resources, in order to simultaneously develop and implement efficient plans and a strategy through a bi-national partnership in all these three AOCs. Round table/workshop sessions with industry and the community will be conducted to strengthen and broaden support for waterfront redevelopment, set priorities and establish partnerships. A design criteria for waterfront development based on community input and sensitivity guidelines will be elaborated. Environment Canada, Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Municipal Affairs, Ontario Ministry of Agriculture, Food, and Rural Affairs, City of Sault Ste. Marie, City of Thunder Bay, City of Duluth, City of Superior, Great Lakes Laboratory for Fisheries and

Aquatic Sciences, Sault Ste. Marie Conservation Authority, Lakehead Regional Conservation Authority, Thunder Bay Harbour Commission, Lakehead University, and McMaster University are partners in this project.  
(Also refers to sections 2.2.8 & 3.0.6)

#### *2.1.4 Directed Recovery of Threatened Species - Brook Trout, Walleye, and Lake Sturgeon*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

In Lake Superior a number of native fish species have been identified as endangered and targeted for rehabilitation. The Fishery Commission and Lake Superior Bi-national Program have been developing strategies to rehabilitate threatened populations of three fish species: lake sturgeon in Thunder Bay, brook charr in Nipigon Bay, and walleye in the upper St. Marys. Differing strategies including spawning habitat restoration, watershed restoration and exploitation controls were tested at each AOC. The implementation schedules, management strategies and tactics for species recovery plans will be developed. Ground truthing will also be carried out for the critical habitats identified through stakeholder and agency consultation and review of historical information. Historical and current information on growth, distribution, habitat, harvest and management direction for lake sturgeon have been summarized in "Status of Lake Sturgeon in Lake Superior". Partners include Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Sea Lamprey Control Centre, U.S. Fish and Wildlife Service, Wisconsin Department of Natural Resources, Michigan Department of Natural Resources, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Great Lakes Fisheries Commission, Chippewa-Ottawa Treaty Fishery Management Authority, University of Guelph, and Thunder Bay Fly Fishermen.

(Also refers to sections 2.2.9, 2.3.4 & 3.0.7)

#### *2.1.5 Northern Watershed Development Plan - Pilot Watersheds: Fort Creek and Slate River*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

Habitat degradation caused by water management practices along rivers and streams has been identified as a concern in each Lake Superior RAP. The North Shore of Lake Superior is unique since a large portion of its impacted areas are predominantly crown land or located in unorganized townships and only 2 of the 5 Lake Superior RAPs are partially under the jurisdiction of a Conservation Authority. This project will develop pilot sub-watershed management plans within 2 RAP areas, for St. Marys Bennett-Davignon Creek (Sault Ste. Marie) and Slate River (Thunder Bay) aiming at preventing pollution at its source. These watersheds best reflect stresses common to Northern Ontario AOCs. The plans will address habitat components (as they relate to agricultural, recreational, forestry, and urban and rural development impacts) of the RAP implementation in a northern environment while following Provincial Guidelines (Ontario Watershed and Sub-watershed Planning Guidelines, June 1993). This initiative will secure the formal commitments to the planning process from partner agencies, form a steering committee and facilitate public involvement. A summary of opportunities, potential benefits and limitations relating to the watershed development plan process has been prepared. Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Agriculture, Food and Rural Affairs, Ontario Ministry of Municipal Affairs, Ontario Ministry of Northern Development and Mines, City of Thunder Bay, City of Sault Ste. Marie, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Sault Ste. Marie Conservation Authority, and Lakehead Region Conservation Authority are also funding this project.

(Also refers to sections 2.2.10 & 3.0.8)

#### *2.1.6 Lake Superior Programs Office Administration*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

Through this project, coordination, planning, implementation monitoring and management for the new and ongoing projects for Lake Superior and its AOCs will continue. This office facilitates delivery of the RAP program for Lake Superior through cooperation amongst agencies, and was recognized with an award for its multi-agency approach. Other funding sources include Environment Canada, Ontario Ministry of Natural Resources, and Ontario Ministry of Environment and Energy.

### *2.1.7 Large River Water Management Planning*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status:     On hold                      (807) 768-1854 ext. 2104

This project documented the success of the Nipigon River Water Management Plan as a means of resolving resource allocation conflicts in large rivers. This approach was applied to all large rivers in Lake Superior, that are subject to hydro-electric induced water level fluctuations. Environmental, economic and social concerns have been documented and recommendations have been made for the development of water management options. A document detailing the process followed to resolve resource conflicts in the Nipigon River/Lake system will be generated. The Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, and Environment Canada are also contributing to this project.  
(Also refers to section 2.3.5)

### *2.1.8 Integrated Ecosystem Monitoring*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status:     On hold                      (807) 768-1854 ext. 2104

In order to determine the effectiveness of rehabilitation initiatives, monitoring must be conducted. A number of cost-effective, volunteer programs collect information to help monitor the effectiveness of rehabilitation. Through this project available information and data collected by local naturalists clubs, fishing derbies, the Secchi Disc Program, the Loon Watch Program and school programs relating to fish and wildlife populations and habitat will be brought together to help monitor change and improvements. All available raw data will be integrated with historical habitat change information. This project is also supported by the Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Fisheries and Oceans Canada's Great Lakes Laboratory for Fisheries and Aquatic Sciences, and White Pines.

## COMMUNICATIONS

### *2.1.9 Lake Superior Habitat Workshop 2001*

Start Date: 1996                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status:     New                              (807) 768-1854 ext. 2104

A technology transfer workshop entitled, "Lake Superior Habitat Workshop 2001" will be held in mid-winter 1997. The workshop will focus on the future of habitat management in the Upper Great Lakes. It will bring together resource managers, RAP team members, lake technical committees and practitioners involved in wildlife and habitat rehabilitation in the Great Lakes Basin. Discussion will centre on key questions such as: how to set and achieve habitat objectives on a lakewide scale or delist the AOCs, in a tight fiscal environment? What are the new developments in habitat science and technology? Ten copies of the workshop proceedings will be produced. Project partners include HabCARES Steering Committee, and Great Lakes Fishery Commission.

### *2.1.10 Education and Communication of Great Lakes 2000 Cleanup Fund Initiatives*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status:     Ongoing                      (807) 768-1854 ext. 2104

Rehabilitation is as much about creating wetlands as it is about changing attitudes and values concerning the environment. This education and communication program, aside from restoring all impaired beneficial uses, will provide a longer term, continuing benefit of increasing public awareness and appreciation for the RAP/GLCuF programs after delisting. This year the development of the "Lakes Effects" Program for implementation in the Canadian Educational System in the Lake Superior Basin will continue. This project will also work with specific schools (St. Edward) and environmental programs (Kingfisher Lake) to promote environmental programs focussed on RAP and CuF goals, objectives and remedial measures. Environmental activities will be initiated in local schools and interpretive signage will be installed at completed habitat restoration sites. Environment Canada, Fisheries and Oceans Canada, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, City of Thunder Bay, Lake Superior Centre, and St. Edward School are also supporting this project.



### *2.1.11 Lake Superior Clean-up / Wake up to your Waterfront*

Start Date: 1995

Contact: Jake Vander Wal, Lake Superior Programs Office

Status: Ongoing

(807) 768-1854 ext. 2104

Building on the tremendous success of the "Wake up to Your Waterfront" events in Thunder Bay, community volunteers are being mobilized for an ambitious clean-up of the entire Lake Superior shoreline - over 4000 kilometres. The project involves volunteers from all facets of the Lake Superior community, including recreational and sportsmen's groups, native organizations, environmental alliances, industrial cooperatives, service clubs and college associations. The volunteers have been organized into teams and assigned responsibility for the clean-up of specific sections of shoreline. To date, 1758 bags of litter and 90 tonnes of refuse were collected by 2414 volunteers from about 41 communities and parks along the lake shore. These events demonstrate the high level of public interest in waterfront environments, and are continuing this year. Environment Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, U.S. National Parks Service, City of Thunder Bay, Thunder Bay Harbour Commission, Thunder Bay Lions Club, Laidlaw Foundation, local newspapers, Thunder Bay TV, and volunteers are also working on this project. (Also refers to section 2.2.11)

## 2.2 THUNDER BAY PROJECTS

The Thunder Bay Area of Concern (AOC) includes the inner and outer harbour and five tributaries. A Remedial Action Plan (RAP) has been developed which addresses wastewater discharges by pulp and paper mills, wood products industries, and the sewage treatment plant (STP) which contribute to water quality and sediment problems. In Thunder Bay, the Great Lakes 2000 Cleanup Fund has supported thirteen projects with more than \$4.0 million. With our partners' support, these projects have a total value of over \$11 million.

### SEDIMENT REMEDIATION

#### 2.2.1 Sediment Removal Demonstration

Start Date: 1992                      Contact: Ian Orchard, Environment Canada  
Status: Ongoing                      (416) 739-5874

Biological and sediment surveys have been done in preparation for the full-scale sediment removal proposed for the area of Thunder Bay Harbour near the Northern Wood Preservers Inc. facility. Over time there has been a seepage of wood preservative products, such as creosote, into the underlying soils. This led to the eventual migration of contaminants into the adjacent waters. Phase 1 and 2 investigations have defined the nature and extent of contamination, enabling the demarcation of "hot zones". Three bench-scale demonstrations of remedial treatment processes are underway. Once the treatability of the contaminated sediment is determined, a full-scale removal and treatment demonstration may be initiated.

### URBAN RUNOFF

#### 2.2.2 Pollution Prevention and Control Planning Study

Start Date: 1993                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

The City of Thunder Bay, in partnership with Environment Canada's Great Lakes 2000 Cleanup Fund and the Ontario Ministry of Environment and Energy, initiated a study in 1993 to investigate direct municipal discharges to receiving waters. The study, termed a Pollution Prevention and Control Plan (PPCP), aims to identify and quantify the sources of pollution from the municipality and to develop a plan which prioritizes the action items. The PPCP comprised two phases. Phase 1 consisted of identification of the direct discharge points to receiving waters from the city, determination of the quality and quantity of the discharges under dry and wet weather conditions and identification of the environmental problems caused by these discharges. Recommendations for further study as part of Phase 2 have been provided in the Phase 1 final report completed in late 1995. Phase 2 consisted of: (i) evaluation of pollution prevention and control strategies for the city, (ii) definition of performance, economic, environmental and social implications of control strategies and (iii) making recommendations regarding the implementation plan, costs and schedule. One recommendation being followed up on is the consideration of options for secondary treatment for the existing primary sewage treatment plant. The PPCP was completed in 1996, and the final report is currently under review. The report details the sources, quality and quantity of municipal wastewaters caused by combined sewer overflows, stormwater runoff and treated sewage from the primary STP. Also, an implementation strategy for control of these sources was developed and is provided in the report. Key highlights include the City's ability to meet the Province's CSO draft policy guidelines with minimal capital costs; however repair and maintenance of CSO control devices is needed. Options for upgrading the primary STP have been identified and actual implementation of the recommendations for the primary STP has been initiated (see *Water Pollution Control Plant Secondary Treatment Study*; Project 2.2.4)

#### 2.2.3 Bacterial Contamination - Chippewa Beach

Start Date: 1992                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Funding complete                      (807) 768-1854 ext. 2104  
Monitoring ongoing

Beach closings are frequent at Chippewa Beach because of bacterial contamination. This project investigated the causes of the bacterial contamination and proposed solutions. The City has completed improvements to the park's septic system.

and has agreed to divert stormwater from the park and the zoo away from the beach. The Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Abitibi-Price Inc., and V.B. Cook Engineering are also supporting this project.

## SEWAGE TREATMENT

### *2.2.4 Water Pollution Control Plant Secondary Treatment Study*

Start Date: 1996                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: New                              (905) 336-6438

The City of Thunder Bay plans to upgrade the Atlantic Avenue Sewage Treatment Plant to secondary treatment standards. Since there are several innovative, cost-effective approaches for secondary treatment, the City is conducting a pilot study to select the most suitable process. The processes being evaluated include modified conventional activated sludge treatment with step-feed, biological aerated filtration and biological phosphorus removal. This project is a follow-up to the *Pollution Prevention Control and Planning Study* (Project 2.2.2). Results from a similar GLCuF supported study in the Detroit River AOC (*Innovative Alternatives for the West Windsor Pollution Control Plant Upgrade - Phase 1 Study* - Project 7.0.4) will be incorporated in the project. The Ontario Ministry of Environment and Energy is also participating in this project.

## HABITAT REHABILITATION

### *2.2.5 Habitat Target Testing Strategy - Wetlands*

Start Date: 1996                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: New                              (807) 768-1854 ext. 2104

This project will establish a baseline of existing and historic upland forest, wetland and riparian habitat conditions through the use of GIS technology and other tools. Existing natural heritage features data sources in the Thunder Bay Area of Concern and in other Lake Superior AOCs will be reviewed to determine their applicability for integration into a single GIS data model. Existing habitat areas will be described and compared to the targets established in the "Habitat Strategy". Recommendations on application of the targets and rehabilitation projects required to move these targets forward, will be made. The data model will be used as an important resource in the development of a long-term habitat management plan, a delisting criterion for the Areas of Concern. The resulting comprehensive environmental data base will be included in the revised Official Plan for the City of Thunder Bay. Partners include Ontario Ministry of Natural Resources, City of Thunder Bay and its Advisory Committee.

### *2.2.6 Developing the Local Planners' Guide to Ecosystem Health*

Start Date: 1996                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: New                              (807) 768-1854 ext. 2104

To ensure remediation of impaired beneficial uses and to prevent recurrence of degradation in the long-term, detailed site-specific information on natural resources in the AOC is needed to assist planners guide short and long-term development. The collection of baseline information on nearshore habitats for testing OMNR's inventory guidelines will be completed. Digital imagery processing of the Thunder Bay aquatic and terrestrial habitat information in a format that is compatible with municipal and provincial databases and GIS is continuing. The habitat status of areas will be determined and these will be classified according to their sensitivity. As the Official Plan of the City of Thunder Bay is now under review, there is a significant opportunity to incorporate the protection and enhancement of valuable habitat areas in the long-term planning process. Partners include Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, City of Thunder Bay, and Lakehead Region Conservation Authority.

### *2.2.7 Kaministiquia River Clean-up and Harbourfront Development*

Start Date: 1993                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                              (807) 768-1854 ext. 2104

The ecological price of economic development has been a long-collapsed fishery, severe water quality degradation, loss of virtually all the productive riparian habitat in the lower reaches and a severed connection between the river and upland habitats. Clean-up and restoration initiatives will include a follow up to the successful community clean-up



“Wake up to Your Waterfront” of the Harbour and tributaries, Adopt a Shoreline Program, an extension of the Kaministiquia River Heritage Park and construction of the 110th Street project. Partners include the Great Lakes Laboratory for Fisheries and Aquatic Sciences, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ontario Ministry of Northern Development and Mines, Ontario Ministry of Tourism and Recreation, and City of Thunder Bay.

### *2.2.8 Evolution of Waterfront Restoration Strategies*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

The St. Marys, Thunder Bay and St. Louis River (U.S.) AOCs are addressing similar issues of degraded waterfront habitat and concerns for future waterfront development. A two-day workshop was held to bring together interested representatives from municipal agencies and organizations. Proceedings from the workshop will be completed and released. Restoration strategies for the three largest urban centres on Lake Superior will be linked through partnerships and pooling of resources, in order to simultaneously develop and implement efficient plans and a strategy through a bi-national partnership in all these three AOCs. Round table/workshop sessions with industry and the community will be conducted to strengthen and broaden support for waterfront redevelopment, set priorities and establish partnerships. A design criteria for waterfront development based on community input and sensitivity guidelines will be elaborated. Environment Canada, Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Municipal Affairs, Ontario Ministry of Agriculture, Food and Rural Affairs, City of Sault Ste. Marie, City of Thunder Bay, City of Duluth, City of Superior, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Sault Ste. Marie Conservation Authority, Lakehead Regional Conservation Authority, Thunder Bay Harbour Commission, Lakehead University, and McMaster University are partners in this project.  
(Also refers to sections 2.1.3 & 3.0.6)

### *2.2.9 Directed Recovery of Threatened Species - Brook Trout, Walleye, and Lake Sturgeon*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

In Lake Superior a number of native fish species have been identified as endangered and targeted for rehabilitation. The Fishery Commission and Lake Superior Bi-national Program have been developing strategies to rehabilitate threatened populations of three fish species: lake sturgeon in Thunder Bay, brook charr in Nipigon Bay, and walleye in the upper St. Marys. Differing strategies including spawning habitat restoration, watershed restoration and exploitation controls were tested at each AOC. The implementation schedules, management strategies and tactics for species recovery plans will be developed. Ground truthing will also be carried out for the critical habitats identified through stakeholder and agency consultation and review of historical information. Historical and current information on growth, distribution, habitat, harvest and management direction for lake sturgeon have been summarized in “Status of Lake Sturgeon in Lake Superior”. Partners include Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Sea Lamprey Control Centre, U.S. Fish and Wildlife Service, Wisconsin Department of Natural Resources, Michigan Department of Natural Resources, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Great Lakes Fisheries Commission, Chippewa-Ottawa Treaty Fishery Management Authority, University of Guelph, and Thunder Bay Fly Fishermen.  
(Also refers to sections 2.1.4, 2.3.4 & 3.0.7)

### *2.2.10 Northern Watershed Development Plan - Pilot Watersheds: Fort Creek and Slate River*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

Habitat degradation caused by water management practices along rivers and streams has been identified as a concern in each Lake Superior RAP. The North Shore of Lake Superior is unique since a large portion of its impacted areas are predominantly crown land or located in unorganized townships and only 2 of the 5 Lake Superior RAPs are partially under the jurisdiction of a Conservation Authority. This project will develop pilot sub-watershed management plans within 2 RAP areas, for St. Marys Bennett-Davignon Creek (Sault Ste. Marie) and Slate River (Thunder Bay) aiming at preventing pollution at its source. These watersheds best reflect stresses common to Northern Ontario AOCs. The plans will address habitat components (as they relate to agricultural, recreational, forestry, and urban and rural development impacts) of the RAP implementation in a northern environment while following Provincial Guidelines (Ontario

Watershed and Sub-watershed Planning Guidelines, June 1993). This initiative will secure the formal commitments to the planning process from partner agencies, form a steering committee and facilitate public involvement. A summary of opportunities, potential benefits and limitations relating to the watershed development plan process has been prepared. Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Agriculture, Food and Rural Affairs, Ontario Ministry of Municipal Affairs, Ontario Ministry of Northern Development and Mines, City of Thunder Bay, City of Sault Ste. Marie, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Sault Ste. Marie Conservation Authority, and Lakehead Region Conservation Authority are also funding this project. (Also refers to sections 2.1.5 & 3.0.8)

#### *2.2.11 Lake Superior Clean-up / Wake up to your Waterfront*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

Building on the tremendous success of the "Wake up to Your Waterfront" events in Thunder Bay, community volunteers are being mobilized for an ambitious clean-up of the entire Lake Superior shoreline - over 4000 kilometres. The project involves volunteers from all facets of the Lake Superior community, including recreational and sportsmen's groups, native organizations, environmental alliances, industrial cooperatives, service clubs and college associations. The volunteers have been organized into teams and assigned responsibility for the clean-up of specific sections of shoreline. To date, 1758 bags of litter and 90 tonnes of refuse were collected by 2414 volunteers from about 41 communities and parks along the lake shore. These events demonstrate the high level of public interest in waterfront environments, and are continuing this year. Environment Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, U.S. National Parks Service, City of Thunder Bay, Thunder Bay Harbour Commission, Thunder Bay Lions Club, Laidlaw Foundation, local newspapers, Thunder Bay TV, and volunteers are also working on this project. (Also refers to section 2.1.11)

#### *2.2.12 Restoring Habitat to the Bay*

Start Date: 1990                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Funding complete                      (807) 768-1854 ext. 2104  
Monitoring ongoing

This project contributes to the rehabilitation of the aquatic ecosystem by increasing the diversity and amount of habitat in the various tributaries to Thunder Bay. Fisheries and Oceans Canada, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ontario Ministry of Northern Development and Mines, Ontario Ministry of Tourism, Culture and Communications, City of Thunder Bay, Lakehead Region Conservation Authority, Thunder Bay Salmon Association, Thunder Bay Field Naturalists, North Shore Steelhead, and Lakehead University are also funding this project.

*Current River* - Lost walleye spawning habitat was improved by clearing debris and replacing it with gravel, cobble, and boulders. Invertebrate production, spawning and early development of walleye and other fish are occurring on the new substrate at the Current River mouth. In addition, access to the upper river's productive habitat by spawning rainbow trout was restored through the construction of a fish ladder and step pools at the Boulevard Lake dam. Forty rainbow trout were transferred to the upper reaches in 1993 and 50 in 1994.

*Neelby-McIntyre Floodway* - In order to re-create the lost littoral or nearshore zone which provides shelter, food, and shoreline diversity for fish and wildlife, four 30 m by 2 m embayments were excavated into the banks of the floodway. Electrofishing results show an increase in use of the embayments compared to nearby control areas in the Floodway.

*McVicar Creek* - Over 120 m of stream profile were recreated through sediment removal and replacement of gravel and boulders. The banks were stabilized by planting trees and shrubs. In addition, the 205 m long crescent-shaped island that was built in the harbour has begun to foster the natural development of a wetland.

*Lower Kaministiquia River* - Stream banks were stabilized, shoreline habitat improved, and a park for public access created. Modifications to the original design to incorporate habitat improvements saved about \$400,000.

*McKellar River* - Two shallow embayments were excavated to provide critical habitat for spawning nursery, shelter and food production for fish, reptiles, amphibians, and waterfowl. This has created 3 hectares of wetland habitat.

### 2.2.13 Habitat II

Start Date: 1993                      Contact: Jake Vander Wal, Lake Superior Programs Office

Status:     Funding complete            (807) 768-1854 ext. 2104

Monitoring ongoing

Under this project, a community clean-up initiated by the Public Advisory Committee removed garbage and debris from 125 km of waterfront in Thunder Bay. An assessment of public involvement in the RAP, and a feasibility study to determine an appropriate strategy for combatting the transfer of exotic organisms to Lake Superior via ballast water were undertaken. A demonstration of an innovative fixed velocity barrier designed to pass fish but block lamprey migration was conducted on the McIntyre River. Preliminary results show that the number of lamprey nests above the barrier has been significantly reduced. This project is also supported by Fisheries and Oceans Canada, Ontario Ministry of Natural Resources, and University of Guelph.



## 2.3 NIPIGON BAY PROJECTS

Nipigon Bay is located at the northernmost point of Lake Superior. The Stage 2 Remedial Action Plan (RAP) report for this Area of Concern (AOC) has been completed. The Great Lakes 2000 Cleanup Fund has funded seven projects with \$1.5 million in support of the Nipigon Bay RAP. With our partners' contributions, these projects have a total value of more than \$6.1 million.

### SEDIMENT REMEDIATION

#### *2.3.1 In-Place Treatment of Contaminated Sediments*

Start Date: 1991                      Contact: Tom Murphy, National Water Research Institute  
Status: Complete                      (905) 336-4602

Treating contaminated sediments in-place is being demonstrated as a potentially less expensive alternative to removal. Environment Canada's National Water Research Institute has developed and is demonstrating this technique. Sediment toxicity is being treated in-place by injecting an oxidant into the sediment (either ferric chloride or calcium nitrate). Addition of the oxidant reduces the acute toxicity of the sediment and enhances bioremediation of organic contaminants in the sediment. The technique has been tested in St. Marys River and Hamilton Harbour. Positive results have been obtained in St. Marys River although long-term monitoring is still being carried out. The technique has also been tested at Laboratory scale using sediment from the Nipigon Bay AOC. Other collaborators include Environment Canada's National Water Research Institute, Great Lakes Preservation Fund, Ontario Ministry of Environment and Energy, Dofasco Inc., Stelco Inc., and Golder Associates.  
(Also refers to sections 2.1.1, 3.0.1 & 10.1.7)

### URBAN RUNOFF

#### *2.3.2 Water Quality Pond Clearwater Creek - Habitat Rehabilitation*

Start Date: 1992                      Contact: Ken Cullis, Lake Superior Programs Office  
Status: Complete                      (807) 768-1826

Urban development has been an important issue to the RAP process in Nipigon Bay. To reverse the effects of urban runoff and development, the degraded Clearwater Creek system has been rehabilitated. A water quality or settling pond, to remove contaminants from the urban runoff carried by the creek has been incorporated as part of the Town of Nipigon's new Marina Park. The site represents one of the first northern locales for this technology which was developed in southern climates. Environment Canada's Environmental Partners Fund, Fisheries and Oceans Canada, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ontario Ministry of Education, Town of Nipigon, Shell, and North of Superior District Roman Catholic Separate School Board of Education contributed resources to this project.

### SEWAGE TREATMENT PLANT OPTIMIZATION

#### *2.3.3 Integrated Water Supply and Treatment Alternatives*

Start Date: 1995                      Contact: Ken Cullis, Lake Superior Programs Office  
Status: On hold                      (807) 768-1826

In both Nipigon Bay and St. Marys River AOCs, significant infrastructure investment is required for both water supply and wastewater treatment. This project will develop an integrated strategy that takes advantage of potential efficiencies and ensures that the system is managed in a comprehensive, effective, reliable and ecosystemic fashion. Options will be developed for the Nipigon Water Treatment Plant, Nipigon Sewage Treatment Plant, Red Rock Sewage Treatment Plant, and East End Sewage Treatment Plant in Sault Ste. Marie. Domtar Packaging, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ontario Ministry of Northern Development and Mines, Ontario Clean Water Agency, Town of Nipigon, Town of Red Rock, City of Sault Ste. Marie, Environment Canada, and Red Rock Indian Band are also supporting this project.  
(Also refers to sections 2.1.2 & 3.0.4)

## HABITAT REHABILITATION

### *2.3.4 Directed Recovery of Threatened Species - Brook Trout, Walleye, and Lake Sturgeon*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status:    New                                      (807) 768-1854 ext. 2104

In Lake Superior a number of native fish species have been identified as endangered and targeted for rehabilitation. The Fishery Commission and Lake Superior Bi-national Program have been developing strategies to rehabilitate threatened populations of three fish species: lake sturgeon in Thunder Bay, brook charr in Nipigon Bay, and walleye in the upper St. Marys. Differing strategies including spawning habitat restoration, watershed restoration and exploitation controls will be tested at each AOC. The implementation schedules, management strategies and tactics for species recovery plans will be developed. Ground truthing will also be carried out for the critical habitats identified through stakeholder and agency consultation and review of historical information. Historical and current information on growth, distribution, habitat, harvest and management direction for lake sturgeon have been summarized in "Status of Lake Sturgeon in Lake Superior". Partners include Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Sea Lamprey Control Centre, U.S. Fish and Wildlife Service, Wisconsin Department of Natural Resources, Michigan Department of Natural Resources, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Great Lakes Fisheries Commission, Chippewa-Ottawa Treaty Fishery Management Authority, University of Guelph, and Thunder Bay Fly Fishermen.

(Also refers to sections 2.1.4, 2.2.9 & 3.0.7)

### *2.3.5 Large River Water Management Planning*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status:    On hold                                      (807) 768-1854 ext. 2104

This project documented the success of the Nipigon River Water Management Plan as a means of resolving resource allocation conflicts in large rivers. This approach was applied to all large rivers in Lake Superior, that are subject to hydro-electric induced water level fluctuations. Environmental, economic and social concerns have been documented and recommendations have been made for the development of water management options. A document detailing the process followed to resolve resource conflicts in the Nipigon River/Lake system will be generated. The Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, and Environment Canada are also contributing to this project.

(Also refers to section 2.1.7)

### *2.3.6 Habitat II - Multi-purpose Breakwall/Marina Guidelines*

Start Date: 1993                      Contact: Ken Cullis, Lake Superior Programs Office  
Status:    Funding complete                      (807) 768-1826  
                 Monitoring ongoing

The Nipigon Bay RAP Team and Public Advisory Committee worked closely with the Waterfront Development Steering Committee and project consultant to incorporate environmental components in the design of the breakwall for the town of Red Rock. The first of its kind in Ontario, this standard armour stone breakwall has been overlaid with suitable habitat features to enhance the aquatic ecosystem, provide access to Nipigon Bay, improve aesthetics and create additional recreational opportunities for marina users. Since building the breakwall, spawning by lake trout and lake whitefish has been documented. Production of the Guidelines is pending. Partners include Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Northern Development and Mines, Red Rock Fish and Game Club, and Township of Red Rock.

### *2.3.7 Enhancing Aquatic Habitat to Bring Back the Walleye*

Start Date: 1990                      Contact: Ken Cullis, Lake Superior Programs Office  
Status:    Funding complete                      (807) 768-1826  
                 Monitoring ongoing

Certain fish and wildlife communities which require minimal human intervention to survive, indicate a well-functioning ecosystem. In Nipigon Bay, habitat restoration, supplemented by stocking, is expected to lead to self-sustaining stocks of walleye. Fisheries and Oceans Canada, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and

Energy, Ontario Ministry of Northern Development and Mines, Ontario Ministry of Tourism, Recreation and Culture, Town of Nipigon, Town of Red Rock, and Ontario Hydro are also supporting this project.

*Stocking* - Over 12,000 walleye have been released into the bay - monitoring of these stocks has documented the first successful walleye reproduction in Nipigon Bay since the population collapsed over 30 years ago.

*Old Mill* - A wetland adjacent to an abandoned sawmill at the mouth of the Nipigon River will be restored. The site clean-up has been completed and natural regeneration of aquatic plants has begun.

*Water Management* - An optimum water management strategy to address the issue of water level fluctuations has been developed in cooperation with all water users.

*Spawning Beds* - In the Lower Nipigon River debris has been removed from historic walleye spawning areas. The spawning beds will be further rehabilitated and techniques to flush silt from the beds, including a self-cleaning spawning substrate system have been designed.

*Nipigon Trail* - Interpretive signage will be provided at specific locations on the 21 km trail system linking the townships of Nipigon and Red Rock.



## 2.4 JACKFISH BAY PROJECTS

Jackfish Bay is one of four Areas of Concern on the Canadian shore of Lake Superior. This bay was originally listed as an AOC based on problems related to conventional pollutants, heavy metals, toxic organics, contaminated sediments, fish consumption advisories and impacted biota due to industrial point sources and in-place pollutants. The Stage 2 Remedial Action Plan (RAP) draft document for this Area of Concern (AOC) has been completed. The Great Lakes 2000 Cleanup Fund provided \$60,000 in support of the Jackfish Bay RAP. With our partners' contributions, the total value of this project is \$235,000.

### SEDIMENT REMEDIATION

#### *2.4.1 Sediment Restoration - Blackbird Creek*

Start Date: 1992                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status:    Funding complete        (807) 768-1854 ext. 2104  
                 Monitoring ongoing

As Blackbird Creek flows over the sediments of Moberly Lake, it degrades water quality in Lake Superior. The feasibility of lowering the water level in the lake or reprofiling the water flow to form a natural channel is being examined. The Draft Options Report was presented to the Public Advisory Committee. Fisheries and Oceans Canada, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Lakehead University, and Kimberley Clark Inc. are also funding this project.

## 2.5 PENINSULA HARBOUR PROJECTS

Peninsula Harbour which is located on the North shore of Lake Superior was identified as an Area of Concern due to problems associated with bacterial contamination, aesthetic impairment, degraded fish and benthic communities, and high levels of toxic contaminants in fish and bottom sediment. The Stage 2 Remedial Action Plan (RAP) draft document for this Area of Concern (AOC) has been completed. The Great Lakes 2000 Cleanup Fund has supported one project for the Peninsula Harbour Remedial Action Plan (RAP) with \$125,000. With our partners' support this project has a total value of nearly \$0.5 million.

### SEDIMENT REMEDIATION

#### *2.5.1 Amelioration of Mercury in Sediments*

Start Date: 1992                      Contact: John Kelso, Fisheries and Oceans Canada

Status:     Funding complete            (705) 942-2848

              Project ongoing

Contaminated sediments continue to cause high levels of mercury in fish at this AOC resulting in public advisories being issued against the consumption of larger sizes of three species of sucker and lake trout. This project is exploring a number of innovative options for treating the sediment in place, by providing impediments or blocks to the mercury methylation process. Research will take place within the Harbour in enclosures called "limno-corrals". Innovative treatment options, including the addition of selenium or clay, will be evaluated within these enclosures. Preliminary results indicate that sodium selenite, wood ash and pH alteration have potential as in-situ mercury amelioration sediment treatments. Funding was also provided by Fisheries and Oceans Canada, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, University of Guelph, and James River Corp.

### 3.0 ST. MARYS RIVER PROJECTS

St. Marys River is a boundary water between the United States and Canada. The Remedial Action Plan (RAP) for this Area of Concern (AOC) is being developed jointly by both countries. The Options Discussion Paper in support of the draft Stage 2 Remedial Action Plan (RAP) document, is being developed. Industrial discharges of organic compounds, heavy metals, cyanide, ammonia, oil, and grease are major concerns in this binational area. Also of concern is the loss of wetlands. The Great Lakes 2000 Cleanup Fund has provided approximately \$0.7 million to nine projects in support of the St. Marys River AOC. With our partners' support, these projects have a total value of over \$1.1 million.

#### SEDIMENT REMEDIATION

##### *3.0.1 In-Place Treatment of Contaminated Sediments*

Start Date: 1991                      Contact: Tom Murphy, National Water Research Institute  
Status: Complete                      (905) 336-4602

Treating contaminated sediments in-place is being demonstrated as a potentially less expensive alternative to removal. Environment Canada's National Water Research Institute has developed and is demonstrating this technique. Sediment toxicity is being treated in-place by injecting an oxidant into the sediment (either ferric chloride or calcium nitrate). Addition of the oxidant reduces the acute toxicity of the sediment and enhances bioremediation of organic contaminants in the sediment. The technique has been tested in St. Marys River and Hamilton Harbour. Positive results have been obtained in St. Marys River although long-term monitoring is still being carried out. The technique has also been tested at Laboratory scale using sediment from the Nipigon Bay AOC. Other collaborators include Environment Canada's National Water Research Institute, Great Lakes Preservation Fund, Ontario Ministry of Environment and Energy, Dofasco Inc., Stelco Inc., and Golder Associates.  
(Also refers to sections 2.1.1, 2.3.1 and 10.1.7)

#### URBAN RUNOFF

##### *3.0.2 Putting A Lid on PAHs in Urban Runoff*

Start Date: 1990                      Contact: Jiri Marsalek, National Water Research Institute  
Status: Complete                      (905) 336-4899

This project investigated non-point sources of polycyclic aromatic hydrocarbons (PAHs) and heavy metal loadings in Sault Ste. Marie and determined the feasibility of their control. Even though significant removals of these chemicals from urban surfaces and urban runoff are feasible, control of point sources is likely more cost-effective than control of non-point sources. Measures investigated to control non-point sources include street sweeping, stormwater settling, stormwater solids separation by swirl devices, runoff infiltration and removal of residual street snow. The project was cooperatively undertaken with the Ontario Ministry of Environment and Energy.

##### *3.0.3 Assessment of Bacterial Pollution of St. Marys River at Sault Ste. Marie*

Start Date: 1990                      Contact: Jiri Marsalek, National Water Research Institute  
Status: Complete                      (905) 336-4899

Following the recommendations of the Upper Great Lakes Connecting Channels Study, a detailed assessment of nearshore faecal bacteria pollution of St. Marys River at Sault Ste. Marie was undertaken by analyzing water samples for faecal coliform, *Escherichia coli*, *Pseudomonas aeruginosa*, faecal streptococci and coliphage. These field data were used to develop a loading model for municipal outfalls, including combined sewer overflows (CSOs), storm sewers, and sewage treatment plant (STP) outfalls. This loading model provided data for the St. Marys River model, which was used to evaluate the various remedial scenarios. The findings of this project will be used in the pollution control planning study for this AOC. This project was cooperatively undertaken with Ontario Ministry of Environment and Energy, and Environment Canada's National Water Research Institute.



## SEWAGE TREATMENT PLANT OPTIMIZATION

### *3.0.4 Integrated Water Supply and Treatment Alternatives*

Start Date: 1995                      Contact: Ken Cullis, Lake Superior Programs Office  
Status:    On hold                      (807) 768-1826

In both Nipigon Bay and St. Marys River AOCs, significant infrastructure investment is required for both water supply and wastewater treatment. This project will develop an integrated strategy that takes advantage of potential efficiencies and ensures that the system is managed in a comprehensive, effective, reliable and ecosystemic fashion. Options will be developed for the Nipigon Water Treatment Plant, Nipigon Sewage Treatment Plant, Red Rock Sewage Treatment Plant, and East End Sewage Treatment Plant in Sault Ste. Marie. Domtar Packaging, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ontario Ministry of Northern Development and Mines, Ontario Clean Water Agency, Town of Nipigon, Town of Red Rock, City of Sault Ste. Marie, Environment Canada, and Red Rock Indian Band are also supporting this project.

(Also refers to sections 2.1.2 & 2.3.3)

## HABITAT REHABILITATION

### *3.0.5 Clergue Park and Gateway Project*

Start Date: 1996                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status:    New                              (807) 768-1854 ext. 2104

Guided by the "Waterfront Development Strategy" adopted in 1988, the City of Sault Ste. Marie has completed a number of development projects which have enhanced waterfront properties, attracted residents and tourists to the waterfront and led to increased public awareness of ecologically sound designs while resulting in direct cost-savings for the municipality. The next steps include finalizing the concepts and designs for the Clergue Park and Gateway project, incorporating habitat design into waterfront development of St. Marys River to ensure that current and future plans for waterfront redevelopment along St. Marys River incorporate ecological values (fish and wildlife habitat, water quality,...) and do not contribute to further degradation. This will result in the development of concepts to rehabilitate 300 meters of degraded shoreline at Clergue Park, 100 meters of degraded shoreline and 400 meters of the lower reach of Fort Creek, during the development of the Gateway Project. The Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Great Lakes Laboratory for Fisheries and Aquatic Sciences, City of Sault Ste Marie, Algoma Central, Algoma Steel, and Traders Metal are also supporting this project.

### *3.0.6 Evolution of Waterfront Restoration Strategies*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status:    Ongoing                      (807) 768-1854 ext. 2104

The St. Marys, Thunder Bay and St. Louis River (U.S.) AOCs are addressing similar issues of degraded waterfront habitat and concerns for future waterfront development. A two-day workshop was held to bring together interested representatives from municipal agencies and organizations. Proceedings from the workshop will be completed and released. Restoration strategies for the three largest urban centres on Lake Superior will be linked through partnerships and pooling of resources, in order to simultaneously develop and implement efficient plans and a strategy through a bi-national partnership in all these three AOCs. Round table/workshop sessions with industry and the community will be conducted to strengthen and broaden support for waterfront redevelopment, set priorities and establish partnerships. A design criteria for waterfront development based on community input and sensitivity guidelines will be elaborated. Environment Canada, Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Municipal Affairs, Agriculture and Food, Ontario Ministry of Municipal Affairs, City of Sault Ste. Marie, City of Thunder Bay, City of Duluth, City of Superior, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Sault Ste. Marie Conservation Authority, Lakehead Regional Conservation Authority, Thunder Bay Harbour Commission, Lakehead University, and McMaster University are partners in this project.

(Also refers to sections 2.1.3 & 2.2.8)

### *3.0.7 Directed Recovery of Threatened Species - Brook Trout, Walleye, and Lake Sturgeon*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: New                              (807) 768-1854 ext. 2104

In Lake Superior a number of native fish species have been identified as endangered and targeted for rehabilitation. The Fishery Commission and Lake Superior Bi-national Program have been developing strategies to rehabilitate threatened populations of three fish species: lake sturgeon in Thunder Bay, brook charr in Nipigon Bay, and walleye in the upper St. Marys. Differing strategies including spawning habitat restoration, watershed restoration and exploitation controls were tested at each AOC. The implementation schedules, management strategies and tactics for species recovery plans will be developed. Ground truthing will also be carried out for the critical habitats identified through stakeholder and agency consultation and review of historical information. Historical and current information on growth, distribution, habitat, harvest and management direction for lake sturgeon have been summarized in "Status of Lake Sturgeon in Lake Superior". Partners include Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Sea Lamprey Control Centre, U.S. Fish and Wildlife Service, Wisconsin Department of Natural Resources, Michigan Department of Natural Resources, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Great Lakes Fisheries Commission, Chippewa-Ottawa Treaty Fishery Management Authority, University of Guelph, and Thunder Bay Fly Fishermen.  
(Also refers to sections 2.1.4, 2.2.9 & 2.3.4)

### *3.0.8 Northern Watershed Development Plan - Pilot Watersheds: Fort Creek and Slate*

Start Date: 1995                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

Habitat degradation caused by water management practices along rivers and streams has been identified as a concern in each Lake Superior RAP. The North Shore of Lake Superior is unique since a large portion of its impacted areas are predominantly crown land or located in unorganized townships and only 2 of the 5 Lake Superior RAPs are partially under the jurisdiction of a Conservation Authority. This project will develop pilot sub-watershed management plans within 2 RAP areas, for St. Marys Bennett-Davignon Creek (Sault Ste. Marie) and Slate River (Thunder Bay) aiming at preventing pollution at its source. These watersheds best reflect stresses common to Northern Ontario AOCs. The plans will address habitat components (as they relate to agricultural, recreational, forestry, and urban and rural development impacts) of the RAP implementation in a northern environment while following Provincial Guidelines (Ontario Watershed and Sub-watershed Planning Guidelines, June 1993). This initiative will secure the formal commitments to the planning process from partner agencies, form a steering committee and facilitate public involvement. A summary of opportunities, potential benefits and limitations relating to the watershed development plan process has been prepared. Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Agriculture, Food and Rural Affairs, Ontario Ministry of Municipal Affairs, Ontario Ministry of Northern Development and Mines, City of Thunder Bay, City of Sault Ste. Marie, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Sault Ste. Marie Conservation Authority, and Lakehead Region Conservation Authority are also funding this project.  
(Also refers to sections 2.1.5 & 2.2.10)

### *3.0.9 Integrated Rapids Habitat Enhancement and Rehabilitation for the St. Marys River RAP*

Start Date: 1994                      Contact: Jake Vander Wal, Lake Superior Programs Office  
Status: Ongoing                      (807) 768-1854 ext. 2104

This project will use a comprehensive approach to remediate habitat in St. Marys River, recognizing linkages among various elements of habitat, and coordinating actions together and with other river uses to promote efficient deployment of material, resources, and funds. Likely first priorities include extending the present rapids, creating a wetland downstream of Whitefish Island, using slag for a spawning shoal at the McLean dredge site, and assessing water discharge dynamics in relation to the extent of rapids habitat. A binational multi-agency workshop was held on May 2 1995 to review the remediation options and make recommendations for the St. Marys River and tributaries. The preferred options document for the Canadian side will be completed for inclusion in the Stage 2 RAP Report. The water flow study on St. Marys River Rapids will be completed. This project is also supported by Environment Canada, Fisheries and Oceans Canada, Great Lakes Laboratory for Fisheries and Aquatic Sciences, Transport Canada, Parks Canada, Youth Internship Program - Human Resources Canada, U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, Michigan Department of Natural Resources, City of Sault Ste. Marie, Sault Ste.

Marie Conservation Authority, Sault Ste. Marie Naturalists, Anglers and Hunters, Great Lakes Fisheries Commission, Sea Lamprey Control Centre, Seine Islands Commercial Fishermen, local naturalists clubs, industries, and volunteers.



## 4.0 LAKE HURON PROJECTS

### 4.1 SPANISH HARBOUR PROJECTS

Spanish Harbour was designated an Area of Concern based on tainting of fish flesh, impaired benthic communities and nutrient enrichment in the adjacent nearshore waters. The Spanish Harbour Remedial Action Plan (RAP) combined Stage 2 and 3 documentation is being completed. The Great Lakes 2000 Cleanup Fund has supported four projects with \$91,800 for the Spanish Harbour RAP. With our partners' support, the projects have a total value of \$200,000

#### SEDIMENT REMEDIATION

##### *4.1.1 Sediment Mass Balance Study*

Start Date: 1994                      Contact: Jan Linquist, Ontario Ministry of Environment and Energy  
Status: Complete 1994              (705) 670-3238

This project developed a model to determine the suspended sediment load, in Spanish River as it enters the Area of Concern at Espanola, which will result in acceptable sediment quality in the depositional areas of Spanish Harbour and Whalesback Channel. The model provides a link between the source of the metals and the resultant sediment chemistry in the harbour. It will allow the RAP Team to assess the effects of various loading reduction scenarios on sediment contamination levels and to make decisions with respect to remedial options. Partners include the Ontario Ministry of Environment and Energy, and Environment Canada's National Water Research Institute.

#### URBAN RUNOFF

##### *4.1.2 Minnow Lake Stormwater Management Study*

Start Date: 1995                      Contact: Brian Cottam, City of Sudbury  
Status: On hold                      (705) 674-3141

This project quantified non-point source metals in the urbanized watershed of Minnow Lake, Sudbury. In 1996, an innovative retrofitting option for stormwater control using an in-lake stormwater detention pond was designed and costed. It is anticipated that loadings of suspended solids, phosphorus and metals may be reduced by approximately 50%. The Ontario Ministry of Environment and Energy, City of Sudbury, and Minnow Lake Research Group also supported this project.

#### SEWAGE TREATMENT PLANT OPTIMIZATION

##### *4.1.3 Assessment of Wastewater Disinfection Methods*

Start Date: 1993                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: Complete 1993              (905) 336-6438

Wastewater at the Espanola Sewage Treatment Plant (STP) currently receives primary and secondary treatment. Disinfection of the secondary effluent prior to discharge into the receiving waters is required. The Spanish Harbour RAP Team and Public Advisory Committee support the investigation of alternatives to chlorine, for disinfection, that represent a reduced health and environmental risk. The use of ultraviolet (UV) light and chlorination/dechlorination, for disinfection were the options considered. Based on the results of this project, the town of Espanola decided to implement the UV option.

#### HABITAT REHABILITATION

##### *4.1.4 Muskellunge Re-introduction Project*

Start Date: 1996                      Contact: Wayne Sellinger, Ontario Ministry of Natural Resources  
Status: New                          (705) 869 1330

Muskellunge are one of four historic fish species, including channel catfish, shorthead redhorse sucker and lake sturgeon, identified in the Spanish Harbour Remedial Action Plan as currently absent or present in low numbers. The last authenticated record of a muskellunge from Spanish Harbour was documented in 1947. Available evidence

suggests water quality and habitat have sufficiently recovered to support muskellunge. A study concluded that the re-introduction of muskellunge was feasible and outlined suitable methodologies for its implementation. This project will develop methodologies to re-establish and initiate implementation to re-establish a self-sustaining population of muskellunge within the Spanish Harbour Area of Concern, through fingerling stocking and population management. A long-term monitoring strategy will be developed to monitor success. Environmental stewardship and public awareness will also be promoted. Project partners include Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Spanish River Public Advisory Committee, Friends of Spanish River, Muskies Canada, Ontario Federation of Anglers and Hunters, Ontario Hydro, E.B. Eddy Forest Products Ltd., local fish and game clubs, and Sir Sanford Fleming College.

## 4.2 SEVERN SOUND PROJECTS

The Severn Sound AOC is located in southeastern Georgian Bay and includes Penetanguishene, Midland, and Sturgeon Bays. The Stage 2 RAP document has been completed. Its implementation dealing with nutrient enrichment and changes in the fish community, is well underway. The Great Lakes 2000 Cleanup Fund has supported 12 projects in Severn Sound with more than \$1.3 million. With our partners' support, these projects have a total value of over \$4.0 million.

### SEDIMENT REMEDIATION

#### *4.2.1 Wye Marsh Lead Shot Project*

Start Date: 1994                      Contact: Ian Orchard, Environment Canada  
Status:    Ongoing                      (416) 739-5874

In order to protect Trumpeter Swans from lead poisoning in Wye Marsh, this project is evaluating an innovative air injection technology for its ability to sink lead shot further into sediment, below the zone of bioavailability. Bench-scale and initial field tests were conducted using the Amphibex, an innovative floating and walking platform, modified to deliver the air-injection equipment to the treatment site. A comprehensive report on the results of this study is currently in progress and further field testing of the technology is underway. Preliminary results indicate that if left to natural forces, the vast majority of lead pellets would not sink out of the range of availability to waterfowl within the foreseeable future. The project is also funded by the Wye Marsh Wildlife Centre.

### URBAN RUNOFF

#### *4.2.2 Urban Stormwater Pollution Control Planning*

Start Date: 1995                      Contact: Keith Sherman, Ontario Ministry of Environment and Energy  
Status:    Ongoing                      (705) 526-7809

The Severn Sound RAP has identified urban stormwater as a significant, controllable source of phosphorus to the Sound. In addition, bacterial contamination from stormwater during wet weather and possible illegal connections to storm sewers during dry weather could also be affecting recreational areas within the Sound. A study of existing storm sewer catchments was undertaken, and potential control and treatment technologies appropriate for small municipalities are being identified. The RAP's target is a 20% reduction of overall urban stormwater phosphorus load. Cooperating agencies include the Ontario Ministry of Environment and Energy, Severn Sound RAP, Town of Midland, and other municipalities in Severn Sound.

### SEWAGE TREATMENT PLANT OPTIMIZATION

#### *4.2.3 Sewage, Sludge and Septage Management for Severn Sound*

Start Date: 1995                      Contact: Doug Baker, Town of Midland  
Status:    Ongoing                      (705) 526-4275

The existing Midland STP, as well as other STPs in Severn Sound, generate more sludge in their sewage treatment processes than can currently be stored for the minimum storage period. This initiative identified a preferred option and costed a preliminary design for sludge storage and septage handling. The project is at the public notification stage of the environmental assessment. Funding was also provided by Ontario Ministry of Environment and Energy, Town of Midland, Town of Penetanguishene, Tay Township, Severn Township, and Severn Sound RAP.

#### *4.2.4 Integrated Sewage Treatment Plant Optimization*

Start Date: 1994                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:    Ongoing                      (905) 336-6281

The objective of this project is to facilitate the cost-effective optimization of all municipal STPs in the Severn Sound AOC and to achieve and maintain the RAP's targets for treated sewage by developing an integrated area-wide technical assistance and training program. Specific activities undertaken include: application of a self-assessment form (Comprehensive Performance Evaluation, CPE), upgrading operating knowledge and motivation through



implementation training and Comprehensive Technical Assistance (CTA) at selected facilities (Penetanguishene Mental Health Centre and Coldwater); identification and implementation of improvements on an area-wide basis including sludge management; analytical requirements and operator assistance; and, transferring skills to municipal staff to ensure continuation of optimal performance is maintained after project completion. Reports for the CPE and CTAs conducted at the Penetanguishene Mental Health Centre and Coldwater have been finalized. RAP targets for phosphorus have been achieved for both plants; however the Coldwater STP will require additional capital equipment to ensure that the target is maintained. The Ontario Ministry of Environment and Energy is also funding this project.

#### *4.2.5 Process Audit - Midland Sewage Treatment Plant*

Start Date: 1992                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

A study was conducted to identify the best effluent quality that can be consistently achieved at the existing STP, without major capital investment in plant expansion. A facility plan was developed. It identified the upgrading and expansion requirements of the Midland STP needed to meet the future compliance limits particularly related to phosphorus discharges. Additional investigations of the secondary clarifiers were also undertaken. Upgrades are now being put in place. The audit also identified that there was no need to spend \$2 million for tertiary filters, resulting in substantial cost-savings. The project was also funded by the Town of Midland, and Ontario Ministry of Environment and Energy.

#### *4.2.6 Phosphorus Removal Evaluation*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

The Severn Sound RAP has established stringent objectives for phosphorus in treated sewage from the eight municipal STPs in the AOC. A review of proven and innovative technologies to optimize phosphorus removal, which might be appropriate for these facilities, was conducted. Analysis of the upgrading alternatives and order-of-magnitude cost estimates were developed for each of the eight facilities to achieve the RAP phosphorus objectives. The project was also funded by Ontario Ministry of Environment and Energy.

### **HABITAT REHABILITATION**

#### *4.2.7 Habitat Target Testing - Wetland: Hogg Creek Watershed*

Start Date: 1996                      Contact: Wes Crown, Township of Tay  
Status: New                              (705) 534-7248

This project will establish a baseline of existing and historic wetland and riparian habitat conditions through the use of GIS technology and other tools. Existing data sources in the study area will be reviewed to determine their applicability for integration into a single GIS model. Existing habitat areas will be described and compared to the targets established in the Habitat Strategy; recommendations on application of the targets and rehabilitation projects required to move these targets forward, will be made. The model or pilot strategy, will be tested on the Hogg Creek Watershed of the Severn Sound Area of Concern. The model will be used to identify and prioritize opportunities for rehabilitation against which to apply remedial action in the AOC. The model will also be used as an important resource in the development of a long-term habitat management plan for the Severn Sound RAP. Project partners include Ontario Ministry of Natural Resources, County of Simcoe, Township of Oro-Mendot, and Severn Sound Remedial Action Plan.

#### *4.2.8 Penetanguishene Harbour Shore Zone Clean-up and Habitat Restoration*

Start Date: 1993                      Contact: Keith Sherman, Ontario Ministry of Environment and Energy  
Status: Ongoing                      (705) 526-7809

A four hectare area offshore at the south end of Penetanguishene Harbour was identified by the RAP as requiring nearshore and shoreline fish and wildlife habitat remediation. Nearly 4000 m<sup>3</sup> of wood debris was removed through the demonstration of an innovative and cost-effective sediment removal technology, known as the 'Visor Grab'. The debris was mechanically separated for recycling. Four hectares of in-lake fish and wildlife habitat were restored and two hectares of wetland were created on adjacent town property. Spawning habitat for northern pike will be provided by restoring channels to a seasonally flooded wetland area. Channel naturalization will enhance water quality through natural stone channel, bank reinforcement and planting of herbaceous and woody plants to provide bank stabilization,

habitat and shading (to enhance the habitat for coldwater fish species, e.g. brook trout). Rehabilitation of fish and wildlife habitat and monitoring of the aquatic community, plant species, shore birds, reptiles and amphibians are being pursued. Interpretive signage will be constructed in the wetland to promote public education. The Town of Penetanguishene, Severn Sound RAP, and members of the community are also funding this project.

#### *4.2.9 Rehabilitating Tributaries to the Sound*

Start Date: 1991                      Contact: Robin Craig, Ontario Ministry of Natural Resources

Status:     Ongoing                      (705) 725-7547

Six river systems (Wye River, Hog River, Coldwater River, Sturgeon River, North River and Copeland Creek) flow through agricultural areas to Severn Sound. Remediation projects to restore fish and wildlife habitat in the tributaries, reduce bank erosion and decrease phosphorus levels, are being undertaken. Specific activities include controlling livestock access to watercourses by fencing and improving stream crossings; tree planting; creating buffer areas; stabilizing eroded sections of river banks, where possible arranging alternate water sources for livestock; and creating valuable linked habitat corridor areas along the river valleys. Increased landowner awareness of various technologies available to protect and rehabilitate degraded riparian areas, will also be promoted. To date, a total of 48 km of riparian stream have been rehabilitated and protected, 260 ha of riparian fragile land have been retired from agricultural use, and 28 ha of wetland have been protected. The total phosphorus loading reduction, to date, has reached approximately 599 kg/yr. Agriculture and Agri-Food Canada, Ontario Ministry of Natural Resources (CFIP), Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, Jobs Ontario, Tiny and Tay Townships, Ducks Unlimited Canada, Tree Planters, Midland Rotary Club, Canada Trust, local landowners, and volunteers are also funding this project.

### RURAL NON-POINT SOURCE POLLUTION

#### *4.2.10 Shoreline and Boating Pollution Control (Fertile Waters in Cottage Country)*

Start Date: 1990                      Contact: Keith Sherman, Ontario Ministry of Environment and Energy

Status:     Funding complete 1993 (705) 526-7809

Project ongoing

This project involved the systematic detection and correction of faulty shoreline sewage systems and the inspection of pleasure boat sewage systems. Cooperation with the Ontario Ministry of Environment and Energy ensured that the sewage systems complied with the Environmental Protection Act regulations and that phosphorus loadings to the Sound were controlled. It is expected that control of these sources will contribute to the reduction of nutrient levels leading to relief from nuisance algal growth in the Sound. Of approximately 3000 sewage systems surveyed, about 600 were found to require abatement. The abatement of these systems is nearing completion. This project was a joint initiative with the Ontario Ministry of Environment and Energy, Friends of Wye Marsh, and local landowners.

#### *4.2.11 Rural Non-Point Source Nutrient Management - Milkhouse*

Start Date: 1995                      Contact: Keith Sherman, Ontario Ministry of Environment and Energy

Status:     Ongoing                      (705) 526-7809

Nutrient enrichment was identified as the primary cause of nuisance algal growth in Severn Sound. This project will improve surface water quality through the reduction of non-point source pollution sources such as erosion, faulty private septic systems, improper and/or inadequate manure management and milkhouse wastewater treatment, and barnyard runoff. This will be achieved by working with landowners to develop nutrient and bacterial control plans for their farms that complement existing landowner driven programs such as the Environmental Farm Plan (EFP), by providing them with technical and financial assistance to address the pollution sources, and by demonstrating alternative/innovative technologies. An innovative milkhouse waste treatment system, the "treatment trench flocculator system", will be constructed and evaluated. Diversion of the milkhouse wastewater to this treatment system and manure storage is estimated to reduce phosphorus loading by at least 40 kg/yr. The project was also funded by the Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, Ontario Ministry of Natural Resources, Simcoe County District Health Unit, North Simcoe Soil and Crop Improvement Association, Ontario Farm Coalition, Environmental Youth Corps, Ducks Unlimited Canada, landowners, and community members.

#### *4.2.12 Environmental Golf Course Management*

Start Date: 1994                      Contact: Robin Craig, Ontario Ministry of Natural Resources  
Status:    Funding complete            (705) 725-7547  
             Project complete in 1995

The purpose of this project was to encourage and assist golf course managers in Severn Sound to initiate and implement plans to increase wildlife habitat on the individual courses. This was done by increasing or enhancing cover, food, and water availability. Proactive environmental practices regarding irrigation, and nutrient and pesticide applications were also encouraged. A report entitled: "Habitat and Water Quality Improvement Manual for Golf Course Management" provides guidance and offers practical insights for addressing concerns. Copies of the report are available through the RAP Implementation Office at (705) 526-7809. Partners include Ontario Ministry of Natural Resources, Tay Township, Georgian Bay Golf Association, New York Audubon Cooperative Sanctuary Program, Royal Canadian Golf Association, volunteers, and local area golf courses.



### 4.3 COLLINGWOOD HARBOUR PROJECTS

Collingwood Harbour was identified as a Great Lakes Area of Concern (AOC) because of algae plagued the waters, as a result of excessive phosphorus inputs. Collingwood Harbour's Stage 3 RAP Report "*Right on Target*" was presented to the federal and provincial Environment Ministers in June 1994. In November 1994, Collingwood Harbour became the first AOC in North America to be delisted. The Great Lakes 2000 Cleanup Fund has contributed to seven projects to support delisting of Collingwood Harbour as an AOC with \$1.47 million. With our partners' support, these projects have a total value of nearly \$4 million.

#### SEDIMENT REMEDIATION

##### 4.3.1 Sediment Removal Demonstration

Start Date: 1992                      Contact: Ian Orchard, Environment Canada  
Status:     Complete                      (416) 739-5874

The bottom sediments of some areas of Collingwood Harbour were contaminated. A sediment removal technique, the Pneuma Airlift Pumping System, was demonstrated in CSL Equity Investment Limited's east and west slips and a portion of the inner harbour, in November and December 1992. The Pneuma Pump technology, which uses a special three chamber vacuum pump, removed approximately 4,330 m<sup>3</sup> of mildly contaminated sediment. The Pump was modified by Voyageurs Marine Construction Co. to improve pumping efficiency and maintenance operations. The Pneuma System was demonstrated to be a successful, environmentally friendly alternative to conventional hydraulic dredging operations and was later used for full-scale clean-up of Collingwood Harbour. In June 1993, a post-demonstration survey was undertaken with a remotely operated vehicle which further illustrated the success of the Pneuma Pump in removing sediment. This project was also supported by Environment Canada's Environmental Protection Branch, Transport Canada, Communications Canada, Ontario Ministry of Environment and Energy, Town of Collingwood, Canada Steamship Lines Equity, Aquateers of Canada, Collingwood Terminals Ltd., and Collingwood Library.

#### URBAN RUNOFF

##### 4.3.2 The Greening of Collingwood

Start Date: 1993                      Contact: Gail Krantzberg, Ontario Ministry of Environment and Energy  
Status:     Funding complete                      (416) 314-7973  
                 Project ongoing

This community-based project focuses on conservation and efficient use of energy and water, as well as, hazardous waste and waste reduction and other pollution prevention activities. A project team representing most of the community is implementing environmental initiatives in all sectors. Some of the projects include Green Home Visits, natural landscaping demonstration sites, neighbourhood environmental meetings, alternative transportation options, greening of business visits, and industrial process audits. The focus on pollution prevention looks beyond remediation efforts and toward a sustainable future for Collingwood. In addition to many community members, the Town of Collingwood, Ontario Ministry of Environment and Energy, Collingwood Public Utilities Commission, Simcoe County Waste Management Department, Ontario Hydro, and Consumers Gas are cooperating on this project.

#### SEWAGE TREATMENT PLANT OPTIMIZATION

##### 4.3.3 Phosphorus Removal Efficiency Optimization - Collingwood STP

Start Date: 1992                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

Treated sewage from the Collingwood sewage treatment plant (STP) was identified as one of the major sources of phosphorus to the Harbour. This study evaluated ways to reduce the phosphorus without expanding the existing STP. A dual-point chemical addition operation strategy (pre-precipitation and simultaneous precipitation), in conjunction with automated control of chemical dosage, was demonstrated to achieve the target level of phosphorus in the treated sewage.

of 0.3 mg/L or less. The use of this technology provided an estimated \$6 million in cost savings by eliminating the need for STP expansion. The project was cooperatively undertaken with the Ontario Ministry of Environment and Energy, and Town of Collingwood.

#### *4.3.4 Enhanced Process/Operational Audits at Collingwood STP*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

The Collingwood STP was a major contributor to high nutrient loads in the Harbour. A comprehensive process audit was undertaken to establish the existing plant capacity, its ability to meet current and anticipated effluent limits, and to identify the most appropriate upgrade requirements. Partners included the Water Technology International Corporation, Ontario Ministry of Environment and Energy, Town of Collingwood, and Ontario Hydro.

### HABITAT REHABILITATION

#### *4.3.5 Collingwood Harbour Habitat Enhancement Project*

Start Date: 1993                      Contact: Jim Collis, Collingwood Harbour RAP  
Status: Ongoing                      (705) 444-6076

This project was designed to develop a stable warm water ecosystem through habitat management. Activities undertaken have included wetland creation and rehabilitation, enhancement of harbour bottom (benthic) habitat, creation of fish spawning habitat, and installation of 2 osprey platforms. Wherever possible, techniques have been used that provide critical habitat for a wide variety of species such as shorebirds, reptiles, fish, amphibians, and semi-aquatic mammals. To date, 1.7 km of riparian and 1.1 ha of wetland habitats were secured or protected. Monitoring of the project continues to evaluate the success of the techniques used. Assessment of the overall performance of the bioengineering techniques will be completed. Supporting agencies include Fisheries and Oceans Canada, Canadian Coast Guard, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Nottawasaga Valley Conservation Authority, Collingwood Harbour RAP/PAC, Collingwood Community Services, Collingwood Habitat Subcommittee, Collingwood Senior League, Georgian Triangle Anglers Association, Shell Environment Fund, Wilfrid Laurier University, Collingwood Collegiate Institute, and Cranberry Resorts.

#### *4.3.6 Black Ash Creek Rehabilitation and Erosion Control*

Start Date: 1993                      Contact: Jim Collis, Collingwood Harbour RAP  
Status: Ongoing                      (705) 444-6076

Black Ash Creek is the largest tributary discharging into Collingwood Harbour. Suspended sediment and nutrients from this stream degrade the quality of Harbour waters and aquatic habitat. Goals of this rehabilitation project include water quality improvement and fish and wildlife habitat enhancement. Implementation of an action plan consisting of background information collection, watershed assessment, strategic planning, and remedial measures is complete. Eleven work projects dealing with: stream bank and escarpment slope stabilization, vegetated buffer strip development, instream habitat rehabilitation and construction of amphibian pools, have been completed. This project has secured or protected 2.7 km of riparian habitat and 0.5 ha of wetland habitat. Results are very encouraging since increases in species diversity and productivity have already been observed. The monitoring initiated in 1992 continues this year to evaluate the success of the techniques. An assessment of the feasibility and effectiveness of the various rehabilitation techniques will be produced. Partners in this project include Fisheries and Oceans Canada, Environment Canada's Environmental Partners Fund, Canadian Wildlife Service, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, Town of Collingwood, Collingwood Harbour RAP/PAC Rotary Club, Collingwood Community Services, Collingwood Harbour Habitat Subcommittee, Nottawasaga Valley Conservation Authority, Collingwood District Naturalists, Collingwood Harbour Boy Scouts, Georgian Triangle Anglers Association, Sir Wilfrid Laurier University, Collingwood Collegiate Institute, Cranberry Resorts, and local landowners.

## RURAL NON-POINT SOURCE POLLUTION

### *4.3.7 Nottawasaga River Ecosystem Rural Non-Point Source Control*

Start Date: 1996                      Contact: Chris Jones, Nottawasaga Valley Conservation Authority  
Status: New                              (705) 424-1479

Monitoring of the Nottawasaga River watershed indicated that the majority of bacteria, nutrient and sediment loadings that reach the mouth of the River originate from rural non-point sources. The measures to remediate rural non-point sources in the watershed will include: livestock access restrictions, manure management, riparian/windbreak planting, and habitat rehabilitation. This project will develop an effective low-cost and transferrable protocol for monitoring trends in ecosystem health, including GIS and ecosystem modelling on a watershed basis. It will also promote ecological awareness in the community and communicate project accomplishments to watershed residents. Demonstration sites featuring low-cost-effective techniques for enhancing wildlife habitat, storage, treatment and disposal of agricultural wastewaters, and naturalization of rural landscapes, will be set-up. Partners in this project include Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, Simcoe County Health Unit, Simcoe County LINC, Nottawasaga Valley Conservation Authority, Blue Mountain Watershed Trust, Canada Trust Friends of the Environment Foundation, Shell Environmental Fund, Salvation Army Hope Acres, and local landowners.

## COMMUNICATIONS

### *4.3.8 ENVIROPARK - Water Quality Theme Playground*

Start Date: 1990                      Contact: Gail Krantzberg, Ontario Ministry of Environment and Energy  
Status: Complete                      (416) 314-7973

This project demonstrates a novel approach to enhancing public awareness of water quality issues and promoting changes in individual behaviour. ENVIROPARK is a joint effort by organizations involved in environmental conservation and recreation that could revolutionize playgrounds. The concept originated with the Public Advisory Committee and is designed to instill in the next generation, an awareness of how everyday things in our lives have a direct impact on our environment. As they play, children are exposed to the link between the home and the water supply, the significance of food chain transfer of contaminants, urban and agricultural runoff, the importance of water conservation, the use of less environmentally harmful products, and other everyday activities that have an environmental impact. Educational materials were prepared and installed, and the ENVIROPARK at Sunset Point was officially opened to the public in the spring of 1994. ENVIROPARK is cooperatively undertaken by local partners including the Town of Collingwood, Ontario Ministry of Environment and Energy, Ronald McDonald's Children's Charities, Optimist Club, Beaver Lumber, Molson's Fund, Shell Canada, Progress Club of Collingwood, Enviromania, Collingwood Chamber of Commerce, Senior League of Collingwood, Canadian Mist Distilleries, and Ontario Ministry of Agriculture, Food and Rural Affairs.



## 5.0 ST. CLAIR RIVER, LAKE ST. CLAIR, DETROIT RIVER REGION

### HABITAT REHABILITATION

#### *5.0.1 St. Clair River Waterways for Wildlife*

Start Date: 1995                      Contact: John Young, Wildlife Habitat Council

Status:    Ongoing                      (313) 237-9624

The Wildlife Habitat Council is encouraging and assisting Canadian corporate landowners along the St. Clair River watershed, in designing and implementing a regional international management plan to enhance their properties for the benefit of native wildlife. An ecosystem management plan involving all Canadian and U.S. stakeholders will provide for improved environmental management in this area while maintaining the economic vitality of the region. This initiative will also coordinate the efforts of private landowners with government and non-government environmental efforts to help reverse the trends toward fragmentation of natural habitats, improve landowner awareness of environmental issues, and provide a plan for habitat management that private landowners may use as a general guide for implementing management projects on their properties. Detroit Edison, and the Joyce Foundation are also supporting this initiative.

#### *5.0.2 Habitat Rehabilitation Coordination*

Start Date: 1995                      Contact: Larry Halyk, Ontario Ministry of Natural Resources

Status:    Ongoing                      (519) 661-2780

The development and implementation of fish and wildlife habitat rehabilitation projects for the Detroit and St. Clair Rivers AOCs are being coordinated through this initiative. Activities include maintaining and enhancing existing partnerships, seeking new sources of support, conducting appropriate environmental and regulatory approval activities, and reporting on progress. Further habitat initiatives will be developed in these AOCs as well as for Wheatley Harbour. Fact Sheets on innovative techniques will be prepared. The Ontario Ministry of Natural Resource, and Ducks Unlimited Canada are also supporting this project.

#### *5.0.3 St. Clair/Sydenham River Regional Habitat Management Plan*

Start Date: 1994                      Contact: Ron Ludolph, Ontario Ministry of Natural Resources

Status:    On hold                      (519) 354-7340

The St. Clair/Sydenham River Regional Habitat Management Plan is a multi-year fish and wildlife habitat rehabilitation strategy designed to increase wildlife populations and expand upon the internationally significant habitat that exists in the St. Clair area. Through this project, copies of the plan were distributed, and presentations were made to solicit partners for the plan. The Ontario Ministry of Natural Resources, Rural Lambton Stewardship Network, Eastern Habitat Joint Venture, and volunteers also supported this project.

## 6.0 ST. CLAIR RIVER PROJECTS

The St. Clair River is an international boundary between the United States and Canada. It connects Lake Huron to Lake St. Clair and passes through St. Clair County in Michigan and Lambton and Kent Counties in Ontario. Two First Nations communities are also within the basin, the Walpole Island First Nation and the Chippewa of Sarnia First Nation. Today, the St. Clair River is home to approximately 33 industries, 20 of which comprise the "Chemical Valley of Canada" in Sarnia/Lambton. Significant losses of nearshore and inland fish and wildlife habitat in the St. Clair River Basin have been primarily due to drainage, in-filling and urbanization. The Remedial Action Plan (RAP) for the St. Clair River Area of Concern (AOC) is being developed binationally. The Stage 2 RAP document has been completed, and implementation is well underway. The Great Lakes 2000 Cleanup Fund has supported fourteen projects with over \$1.02 million for the St. Clair River RAP. With our partners' support, these projects have a total value of approximately \$3.5 million.

### SEDIMENT REMEDIATION

#### *6.0.1 Characterization of Sediment Impact Zones - Benthic Community and Predictive Model*

Start Date: 1994                      Contact: Gary Johnson, Ontario Ministry of Environment and Energy  
Status: Ongoing                      (519) 383-3794

A study is underway to assess changes and improvements in sediment quality and benthic community structure within sediment impact zones identified in the St. Clair River. To complement this activity, the Roxann acoustical device has been used to characterize the bottom of the river and produce accurate maps delineating zones of contamination. One significant finding is the discovery of a small area of highly contaminated sediments with the uppermost priority 1 zone. Based on the results of these characterization activities, accurate maps delineating zones of contamination will be produced, remedial options will be evaluated and an approach for remediating St. Clair River sediments will be recommended. The Ontario Ministry of Environment and Energy, Geological Survey of Canada, and Lambton Industrial Society are also supporting this project.

### URBAN RUNOFF

#### *6.0.2 Evaluation of Hydrosel® Flusher for Sediment Cleaning in Combined Sewer Overflow Detention Tank*

Start Date: 1996                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: New                              (905) 336-6281

Combined sewer overflow detention tanks require periodic cleaning to remove sediments deposited during settling of the combined sewage. Benefits of the Hydrosel® Flusher system include effective cleaning (based on a survey of European installations) and water conservation since the Flusher uses the stored combined sewage for cleaning the detention tank. This is the first installation in North America; its design incorporates suggestions for improvements from the European users. This project will monitor the Hydrosel® Flusher Device's cleaning effectiveness and the amount of sediments retained in the tank. Partners in the project are the City of Sarnia, and Ontario Ministry of Environment and Energy.

#### *6.0.3 Pollution Prevention and Control Planning Study*

Start Date: 1991                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: Complete                      (905) 336-6438

The City of Sarnia, in partnership with Environment Canada's Great Lakes 2000 Cleanup Fund and the Ontario Ministry of Environment and Energy, completed a Pollution Prevention and Control Planning (PPCP) study in 1993. The study identified and quantified municipal-related pollution and developed an implementation plan. Recommendations included: (i) provision of four storage tanks to retain 90% of wet weather flow to reduce the discharge of combined sewer overflows (CSO); (ii) sewage treatment plant modifications, including additional primary sedimentation capacity, addition of secondary treatment (including nitrification), use of non-toxic disinfection (either dechlorination or ultraviolet disinfection) and (iii) collection of stormwater flows to the harbour and treatment in a single wet pond. Implemented to date are: (i) preparation of a design and Environmental Study Report for the upgrade of the STP, and (ii) installation of the largest of the four proposed storage tanks for CSO control.

#### 6.0.4 Controlling Bacterial Pollution

Start Date: 1990                      Contact: Jiri Marsalek, National Water Research Institute  
Status: Complete                      (416) 336-4899

Following the recommendations of the Upper Great Lakes Connecting Channels Study, a detailed assessment of nearshore faecal bacteria pollution of the St. Clair River in Sarnia was undertaken by analyzing water samples for faecal coliform, *Escherichia coli*, *Pseudomonas aeruginosa*, faecal streptococci and coliphage. These field data were used to develop a loading model for municipal outfalls, including combined sewer overflows, storm sewers, and sewage treatment plant (STP) outfalls. This loading model provided data for the St. Clair River model, which was used to evaluate several remedial scenarios. The highest remedial priorities were assigned to faecal bacteria discharges in dry weather, caused by cross-connections or malfunctions in the sewer system, followed by combined sewer overflows and stormwater. The findings were utilized in the pollution control planning study for this AOC. This project was cooperatively undertaken by the Ontario Ministry of Environment and Energy, and Environment Canada's National Water Research Institute.

### SEWAGE TREATMENT PLANT OPTIMIZATION

#### 6.0.5 Wastewater Treatment Plant Optimization - Industrial Applications - Polysar Rubber Corporation

Start Date: 1991                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

In Sarnia, Polysar Rubber Corporation's effluent is treated in an activated sludge process and the treated effluent is discharged into the St. Clair River. The suitability of model-based simulation tools currently being used to address similar operational issues in municipal treatment plants will be demonstrated. The tools were used to develop operational and monitoring strategies to maximize the performance of Polysar's wastewater treatment plant in removing conventional and trace contaminants. The project was partially funded by Polysar Rubber Corporation, and Environment Canada's Technology Development Directorate.

### HABITAT REHABILITATION

#### 6.0.6 McKeough Floodway Reforestation / Wildlife Habitat Project

Start Date: 1996                      Contact: Donald Craig, St. Clair Region Conservation Authority  
Status: New                              (519) 245-3710

The Darcy McKeough floodway was constructed to provide flood protection to Wallaceburg and portions of Chatham and Sombre townships. In 1991, the St. Clair Region Conservation Authority began reforesting the agricultural lands on top of the berms as part of the St. Clair River Remedial Action Plan. The reforestation of the channel is a small component of a multi-phase plan for the management of 866 ha of land by the St. Clair Region Conservation Authority. This initiative will carry out site preparation of 6.1 ha of land along the floodway. It will also purchase trees for Spring planting. Completion of the remaining 34 ha of reforestation work on the channel will result in a continuous forested corridor of approximately 7 km in length, connecting over 7 wood lots. The channel will also provide an effective demonstration model for re-establishing Carolinian forest on other severely disturbed sites in other Areas of Concern. The Wildlife Habitat Council, Detroit Edison, Lambton Wildlife Inc., Wallaceburg District Secondary School, and St. Clair Region Conservation Authority also funded this project.

#### 6.0.7 MacDonald Park Fish and Wildlife Rehabilitation

Start Date: 1996                      Contact: Ron Ludolph, Ontario Ministry of Natural Resources  
Status: New                              (519) 354-7340

MacDonald Park is an 8 ha park located along the Chenal Ecarte Tributary of the St. Clair River. It was identified as a candidate site for habitat rehabilitation under the Chenal Ecarte/Sydenham River Wetland Recreation project. It used to be a healthy and productive marsh, until in-filling and dredging transformed it into an extensive dry land area with steep sloped channels. The final phase of this project involves the stabilization of the wetland shoreline through bioengineering and revegetation of the newly graded channel shoreline using selective plantings or native vegetation. Additional habitat components, such as basking logs and aggregate material will be installed, to provide a diversity of habitats for fish species. The Marsh Monitoring Program protocol will be incorporated to monitor marsh bird and



amphibian populations. Partners include Ontario Ministry of Natural Resources, Environmental Youth Corp, Wetlands Habitat Fund, St. Clair Parkway Commission, Rural Lambton Stewardship Network, Eastern Habitat Joint Venture, Community Fisheries Improvement Program, Friends of the Environment Foundation, Bluewater Anglers, Aqua-Terre Environmental Consultants, Wallaceburg High School, Shell Environmental Fund, The Body Shop, and numerous volunteers.

#### *6.0.8 St. Clair River Habitat Target Testing*

Start Date: 1996                      Contact: Garry Johnson, Ontario Ministry of Environment and Energy  
Status:    New    (519) 336-4030

This project will establish a baseline of existing and historic upland forest, wetland and riparian habitat conditions through the use of GIS technology and other tools. Existing natural heritage features data sources in the Ontario and Michigan study area will be reviewed to determine their applicability for integration into a single GIS data model. Existing habitat areas will be described and compared to the targets established in the Habitat Strategy. Recommendations on application of the targets and rehabilitation projects required to move these targets forward will be made. In the next phase, the focus will be on the Clay Creek sub-watershed, to test the model or pilot strategy, identify and prioritize opportunities for rehabilitation against which to apply remedial action in the AOC. The data model will also be used as an important resource in the development of a long-term habitat management plan - a delisting criterion - for the St. Clair River RAP. Project partners include Ontario Ministry of Natural Resources, U.S. Army Corp of Engineers, Lambton County, St. Clair River RAP, St. Clair Region Conservation Authority, Wildlife Habitat Council, Rural Lambton Stewardship Network, and others.

#### *6.0.9 Ontario Native Tallgrass Prairie Nursery*

Start Date: 1994                      Contact: Ron Ludolph, Ontario Ministry of Natural Resources  
Status:    Ongoing    (519) 354-7340

The St. Clair River watershed lies within the historical range of tallgrass prairie in Canada and some remnants still exist. Sixteen prairie related species are listed as rare, threatened or vulnerable by the Committee on the Status of Endangered Wildlife in Canada. This project will establish a self-sustaining nursery which will produce local, indigenous seeds and plants necessary to re-establish tallgrass prairie habitat in Southern Ontario. A manual entitled "Restoring Canada's Native Prairies, A Practical Manual" by John Morgan has been produced and is now being distributed. This project will also create opportunities for education and technology transfer, contribute to the recovery of threatened species, such as northern bobwhite, Henslow's sparrow, slender bush clover and expand populations of seven species of endangered, threatened or vulnerable plants. Agriculture Canada, Ontario Ministry of Natural Resources, Ontario Ministry of Transportation, Ontario Ministry of Agriculture, Food and Rural Affairs, St. Clair Region Conservation Authority, Environmental Youth Corp, Wildlife Habitat Canada, Eastern Habitat Joint Venture, Ducks Unlimited Canada, Rural Lambton Stewardship Network, Abandoned Pits Fund, Maidstone Landfill Site, Essex Solid Waste Authority, Ontario Realty Corporation, Ridgetown College of Agricultural Technology, and numerous volunteers, are also supporting this project.

#### *6.0.10 Centre-by-the-Bay Wetland Creation*

Start Date: 1994                      Contact: Brenda Lorenz, Centre by the Bay  
Status:    Complete 1995    (519) 383-8472

This project designed, built and planted a functional demonstration wetland surrounded by an interpretive pathway to enhance the existing landscape and provide increased educational opportunities to the Sarnia area. The wetland is connected hydraulically to the St. Clair River. Many species including sunfish, painted turtles, mallard ducks, muskrats and tree swallows are already using the new habitat. Pickerel weed and arrowhead have been blooming and add colour to the landscape. A riparian buffer has been established around the wetland to protect it and provide food and nesting sites for local fauna. To date, 2.7 km of riparian habitat and 1.1 ha of wetland habitat have been rehabilitated and secured, recovery plans for Butler's garter snake and four native tallgrass species were initiated. The Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, City of Sarnia, St. Clair River RAP, Centre-by-the-Bay, Aqua-Terre Environmental Consultants, St. Clair Parkway Commission, and local high school and Lambton College students have also supported the project.

### *6.0.11 St. Clair/Chenal Ecarte/Sydenham River Wetland Recreation*

Start Date: 1993                      Contact: Ron Ludolph, Ontario Ministry of Natural Resources  
Status:     On hold                      (519) 354-7340

A vast wetland once existed along the Chenal Ecarte River (a tributary of the St. Clair River); however, most of the original wetland area has been lost to agricultural and residential development. A number of candidate sites have been identified along the river as suitable for habitat rehabilitation (i.e. wetland creation and tallgrass prairie). A number of different wetland re-creation techniques will be explored including breaching of existing flood protection dykes to allow natural flooding of target areas, while permitting a hydrological connection between the wetland and river (i.e. fish access). Opportunities for negotiating the purchase of up to 374 acres slated for wetland creation are being explored. Indigenous aquatic vegetation will be restored throughout the wetlands using native seed sources. Upland areas associated with these wetlands will also be restored using native tallgrass prairie seed sources. Flood control dykes will be constructed to protect the surrounding agricultural and residential areas. Groups participating in this venture include Environment Canada's Environmental Conservation Branch, Ontario Ministry of Natural Resources, St. Clair Region Conservation Authority, Ducks Unlimited Canada, Eastern Habitat Joint Venture, Nature Conservancy of Canada, Wildlife Habitat Canada, and Wildlife Habitat Council.

### *6.0.12 Stag Island Habitat Rehabilitation*

Start Date: 1994                      Contact: Ron Ludolph, Ontario Ministry of Natural Resources  
Status:     Ongoing                      (519) 354-7340

This project will protect and enhance an existing wetland within Stag Island at the upper end of the St. Clair River. Indigenous aquatic vegetation may be re-established in the wetlands while associated upland areas will be revegetated in tallgrass prairie, in future. Tallgrass Prairie plant plugs will be purchased. A 20-acre site will be prepared for Tallgrass Prairie and native berry producing shrubs to restore it from dredge spoil. Tallgrass Prairie plant plugs will be purchased. Stag Island was chosen as a candidate site because it may be the only location in the upper reaches of the river suitable for a project of this nature due to the intensive urban and industrial development along both the Ontario and Michigan shorelines. Because of its location in the middle of the river, there is an opportunity to make this a cooperative international project and to create opportunities for education and public awareness. Funding sources include Ontario Ministry of Natural Resources, St. Clair Region Conservation Authority, St. Clair National Wildlife Areas, Lambton Wildlife Incorporated, Wetlands Protection Fund, Rural Lambton Stewardship Network, Wildlife Habitat Council, Wildlife Habitat Canada, Eastern Habitat Joint Venture, Ducks Unlimited Canada, Nature Conservancy of Canada, Moore Optimist Club, McLean Foundation, Weeden Foundation, Bluewater Anglers, Lambton Industrial Society, Shell Canada Environmental Fund, Community Wildlife Improvement Program, Community Fisheries Improvement Program, and volunteers.

## **RURAL NON-POINT SOURCE RUNOFF**

### *6.0.13 Conservation Tillage*

Start Date: 1995                      Contact: Ron Ludolph, Ontario Ministry of Natural Resources  
Status:     Funding complete                      (519) 354-7340  
                 Project ongoing

Runoff from agricultural land is a significant source of nutrients, pesticides and sediment to the St. Clair River. Conservation tillage is the single most influential technology shaping farming today. However, with the predominantly clay soils of Lambton and Kent counties, adoption of this method has been slow. This project is demonstrating a newly developed planter/drill combination to local farmers and soil and crop experts. It allows farmers to include corn in a conservation tillage crop rotation for clay soils thereby protecting soils and enhancing wildlife habitat. This will also demonstrate opportunities to enable agricultural, educational and scientific communities to participate in resource technology transfer. Partners in this project include Ontario Ministry of Natural Resources, Ontario Ministry of Agriculture, Food and Rural Affairs, St. Clair Region Conservation Authority, Wildlife Habitat Canada, Eastern Habitat Joint Venture, Rural Lambton Stewardship Network, Lambton Soil and Crop Improvement Association, Great Plains, Sanders Farm Equipment, Janiecs Farm Equipment, and local farmers.

## COMMUNICATIONS

### *6.0.14 St. Clair River Trail*

Start Date: 1996                      Contact: Tim Hanna, Moore Township  
Status:     New    (519) 867-2655

This project will construct a 17 km multi-use trail system and improve the native habitat along the St. Clair River from the northern boundary of Moore Township to the south. An important public education program will focus on communicating the environmental, social and historical importance of the watershed and natural habitat, while developing community understanding and ownership in the St. Clair River Watershed area. The trail system is being designed and constructed. In 1996/97, trees, mulch and interpretive signage describing fish and wildlife species, habitats and water quality in the St. Clair River Area of Concern, will be purchased. Partners include Moore Township, County of Lambton, St. Clair Parkway Commission, Windover Nurseries, Kinsmen Club, Niagara Gas, and numerous volunteers.



## 7.0 DETROIT RIVER PROJECTS

The Detroit River is an international boundary between the United States (Michigan) and Canada (Ontario). Both jurisdictions have agreed to develop a joint Remedial Action Plan (RAP) to address degraded water quality conditions. This RAP has completed its Stage 2 document and submitted it to the International Joint Commission. The Great Lakes 2000 Cleanup Fund has supported eight projects for the Detroit River RAP with almost \$1 million. With our partners' support these projects have a total value of over \$2.5 million.

### URBAN RUNOFF

#### *7.0.1 Pollution Prevention and Control Planning Study*

Start Date: 1992                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: Ongoing                      (905) 336-6438

The City of Windsor, in partnership with Environment Canada's Great Lakes 2000 Cleanup Fund and the Ontario Ministry of Environment and Energy, initiated a Pollution Prevention and Control Planning (PPCP) study in 1992 to investigate direct municipal discharges to receiving waters in the Detroit River Area of Concern. The study will identify and quantify municipal pollution and develop a plan which prioritizes the action items. The PPCP has three phases: Phase 1, which is now complete, identified all points of wastewater discharged into the Detroit River, determined the quantity and quality of the wastewater and their impact on the River. Phase 2 which is now underway, consists of a review of various pollution abatement measures and their performance, economic, environmental and social implications; and, Phase 3 will provide recommendations, a list of preferred alternatives and a schedule for implementation.

#### *7.0.2 Controlling Bacterial Pollution*

Start Date: 1990                      Contact: Jiri Marsalek, National Water Research Institute  
Status: Complete                      (416) 336-4899

A detailed assessment of nearshore faecal bacteria pollution of the Detroit River in Windsor was conducted by analyzing water samples for faecal coliform, *Escherichia coli*, *Pseudomonas aeruginosa* and faecal streptococci, following the recommendations of the Upper Great Lakes Connecting Channels Study. The field data were used to develop a loading model for 47 municipal outfalls. This loading model provided input to the Detroit River model which was used to evaluate several remedial scenarios focusing on controls at the Little River Sewage Treatment Plant and eight major outfalls. Introduction of these controls should lead to large improvements in faecal bacteria levels in the study area. Other participants in this study were the Ontario Ministry of Environment and Energy, Environment Canada's National Water Research Institute, and University of Windsor.

### SEWAGE TREATMENT PLANT OPTIMIZATION

#### *7.0.3 Innovative Alternatives for the West Windsor Pollution Control Plant Upgrade - Phase II*

Start Date: 1995                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

The City of Windsor evaluated an innovative technology known as the Biological Aerated Filter in a pilot demonstration at the West Windsor plant to determine its suitability for use in the upgrade of the Pollution Control Plant. The results were compared to previously tested processes (Phase I). An evaluation of comparative merits of these processes enabled the selection of the best technology; this Biological Aerated Filter technology was found to be \$33 million cheaper than the conventional activated sludge process. Collaborators include the City of Windsor, and Ontario Ministry of Environment and Energy.

#### *7.0.4 Innovative Alternatives for the West Windsor Pollution Control Plant Upgrade - Phase I*

Start Date: 1994                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

An evaluation of innovative alternatives for upgrading the City's West Windsor Sewage Treatment Plant (STP) from primary treatment to provide full secondary biological treatment has been completed. The four pilot-scale innovative

secondary treatment alternatives investigated included trickling filter/solids contact (TF/SC) process, biological aerated filter (BAF) process, rotating biological contactor, and high rate activated sludge process. The initial study confirmed each process as being acceptable for meeting conventional performance requirements for secondary treatment. However, additional experimental work was considered necessary to confirm the nitrogen removal performance capability of the BAF and TF/SC processes. All processes were judged as being somewhat less costly than the conventional activated sludge process. Collaborators included the City of Windsor, and Ontario Ministry of Environment and Energy.

#### *7.0.5 STP Process Audit - Windsor*

Start Date: 1992                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

The City of Windsor has undertaken several initiatives to address water quality concerns in the Detroit River AOC. The Windsor process audit showed that using innovative methods to optimize sewage treatment results in improved reliability, enhanced performance, and increased the cost efficiency of operation. More significantly, it clearly demonstrated that by spending \$200,000 to closely examine existing facilities and introduce up-to-date technology, the City needed to spend only \$5.2 million for in-plant modifications instead of the projected \$12-14 million in capital expansion costs. Collaborators included the City of Windsor, and Ontario Ministry of Environment and Energy.

### HABITAT REHABILITATION

#### *7.0.6 Windsor Salt River Front Rehabilitation*

Start Date: 1994                      Contact: Jim Hartman, Essex Region Conservation Authority  
Status: On hold                      (519) 776-8688

This fish and wildlife habitat rehabilitation project will see the creation of a wetland of up to 1 km of shoreline and three offshore islands to protect the Detroit River shoreline from wind, river and boat erosion. A shoreline park, with a central marsh area and excavated channel to improve water flow will be created, following the excavation of salt-contaminated soil. The islands and wetland will be planted in native aquatic, riparian and upland vegetation to provide greatly needed wildlife nesting, shelter and feeding sites and increased fish habitat. A design study was completed in 1995/96 and implementation will begin in 1997. Partners include Ontario Ministry of Natural Resources, Essex Region Conservation Authority, U.S. Army Corps of Engineers, and Canadian Salt Company.

#### *7.0.7 Ruwe Marsh Rehabilitation Project*

Start Date: 1994                      Contact: Don Hector, Ontario Ministry of Natural Resources  
Status: Complete                      (519) 354-7340

The Canard River Marshes are the most significant wetland system in the Detroit River Area of Concern, and the third most important staging area for a substantial portion of the world's canvas back duck population. Through this project, repair and re-construction of 1125 m of the existing finger dyke was completed in order to protect 366 ha of valuable wetland habitat. Environment Canada's Environmental Conservation Branch, Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Essex Region Conservation Authority, Ducks Unlimited Canada, University of Guelph, Dean Construction, and landowners also supported this project.

### RURAL NON-POINT SOURCE POLLUTION

#### *7.0.8 Rural Non-Point Source Remediation Program - Canard and Little Rivers and Turkey Creek*

Start Date: 1996                      Contact: Paul Hermans, Essex Region Conservation Authority  
Status: New                      (519) 776-5209

The tributary watersheds to the Detroit River AOC are flat clay plains which have previously been identified (Pollution from Land Use Activities Reference Group - PLUARG) as the highest contributors of phosphorus and sediment loadings to the Great Lakes. Intensive cash cropping combined with a high percentage of open municipal drains increase the pollution delivery potential from non-point sources to the Detroit River. A comprehensive rural non-point source remediation plan will be developed and implemented for this area. Remediation will include measures such as creating buffers, planting windbreaks, upgrading faulty septic systems, utilizing no-tillage planting technologies and associated

measures. This project will incorporate monitoring/modelling to assess its success. Education and promotion of sound management practices will also be carried out. In addition, a Conservation Demonstration Farm will be established at Holiday Beach Conservation Area, to demonstrate how Best Management Practises can be implemented in today's farming climate while minimizing impacts on natural resources: water, soil and wildlife. Partners in this project include Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, Essex Region Conservation Authority, Federation of Agriculture, Essex Soil and Crop Improvement Association, Agri-Business, Ducks Unlimited Canada, and local landowners.



## 8.0 LAKE ERIE PROJECTS

### HABITAT REHABILITATION

#### 8.0.1 Lake Erie - Wetlands Database

Start Date: 1995                      Contact: Wendy Leger, Environment Canada

Status:      Ongoing                      (905) 336-4630

This project will complete and distribute a Geographic Information System (GIS) Database on overland contamination potential for all evaluated wetlands in the Lake Erie and St. Clair River basins. A summary of the landscape processes and database was presented at the Watershed Management Symposium in December 1996. A User's Manual summarizing the input databases and their interpretation, landscape processes involved, overland delivery and watershed features of the Lake Erie basin, and directions regarding the use of the database, will also be provided. The source of contamination is primarily agricultural. This information will be particularly useful to Conservation Authorities, Lake Erie Lakewide Management Plan and the Detroit River, St. Clair River, and Wheatley Harbour Remedial Action Plans. Environment Canada's Great Lakes Environment Office, Environmental Conservation Branch and Water Issues Division, Canadian Wildlife Service, Ontario Ministry of Natural Resources, Wildlife Habitat Canada, University of Waterloo, Wilfrid Laurier University, Grand River Heritage Project, and FOCALerie Conservation Authorities are also supporting this endeavour.

#### 8.0.2 Rondeau Bay Watershed Rehabilitation

Start Date: 1994                      Contact: Janet Planck, Environment Canada

Status:      Ongoing                      (905) 336-6282

This project develops a community-based, integrative ecosystem approach to fish and wildlife habitat rehabilitation activities in a watershed which has suffered significant habitat losses due to historical land use practices. Rondeau Bay is an area of social, economic, and biological importance. Water quality is impaired by high levels of sediment, phosphorus, agricultural chemicals and bacteria which presently enter the Bay. Mitigation of sewage problems will be investigated. Planning for rehabilitation and re-creation of high quality fish habitat (for both sport and forage fish) and re-establishing native vegetation to create a wetland for wildlife, is underway. Activities to be undertaken in 1996/97 include: use of beetles as bio-control agents for purple loosestrife, use of prairie seed mix to establish grassed waterways and buffers, underwater clean-up, erection of nesting platforms and implementation of Yellow Fish Road Program. Monitoring programs have been established and are being largely maintained by volunteers. A demonstration cattle access control and stream channel naturalization project has been completed. A preliminary report prioritizing rehabilitation works will be produced. Environment Canada's Environmental Conservation Branch, Environmental Youth Corp, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Lower Thames Valley Conservation Authority, Ontario Ranger, Community Wildlife Involvement Program, Community Fisheries Involvement Program, Rural Lambton Stewardship Network, Kent Stewardship, Middlesex Rural Resource Stewardship, Eastern Habitat Joint Venture, Carolinian Canada, Canada Trust Friends of the Environment, Interprovincial Pipeline, Project Tree Cover, private businesses, and numerous volunteers are also supporting this project.

#### 8.0.3 Long Point Bay Rehabilitation

Start Date: 1994                      Contact: Jeff Robinson, Environment Canada

Status:      Funding complete                      (519) 681-0486

Project ongoing

The Long Point wetlands are experiencing increasing demands for recreational and residential development. This project uses a community-based approach to attain the goal of sustainable development. A "Community Action Plan" has been developed. The feasibility of restoring natural processes to sections of shoreline has been investigated. Environment Canada's Environmental Conservation Branch, Ontario Ministry of Natural Resources, Long Point Region Conservation Authority, and Long Point Biosphere Reserve Committee are also supporting this project.

#### *8.0.4 Wetland Rehabilitation - Dunnville Marshes*

Start Date: 1992                      Contact: Jeff Robinson, Environment Canada  
Status:    Funding complete            (519) 681-0486  
             Project ongoing

Through this project, 250 ha of wetlands at the mouth of the Grand River at Lake Erie will be managed by the Grand River Conservation Authority. The wetlands have been degraded by silt loading from the Grand River, agricultural runoff, and non-point source pollution. Through partnerships, the marshes will be restored to improve fish spawning and rearing habitat, waterfowl and other migratory bird habitat, and enhance biodiversity. Emphasis is also being placed on encouraging community level stewardship of wetlands. A draft Management Plan with suggested rehabilitation strategies has been prepared. Partners include the Ontario Ministry of Natural Resources, Nature Conservancy of Canada, Wildlife Habitat Canada, Ducks Unlimited Canada, Environment Canada's Environmental Conservation Branch, Fisheries and Oceans Canada, and local stakeholders.

### RURAL NON-POINT SOURCE POLLUTION

#### *8.0.5 Lower Big Otter Remedial Project*

Start Date: 1995                      Contact: James Oliver, Long Point Region Conservation Authority  
Status:    Ongoing                      (519) 428-4623

This project will pursue education/communication activities to promote Best Management Practices to target audiences, including rural landowners, municipalities, and county Soil and Crop Improvement Associations. It will address the impact of sediment, bacteria and other pollutants, not only at Port Burwell, but to the Lake Erie Ecosystem, sourced from the Lower Big Otter Creek watershed. Up to 20 full-scale projects dealing with targeted water quality improvement based on the Phase 1 Strategy Document, are being pursued. Projects include: restricting cattle access, improving sewage and manure management, establishing buffer plantings and shoreline naturalization through retiring agricultural land into permanent cover. Six landowners have committed to retiring agricultural land along the Big Otter Creek and tributary ravines for Stream Buffer Demonstration Sites; this commitment resulted in 3.5 km of permanent riparian buffer. A GIS database for the Big Otter watershed, using information previously collected in cooperation with FOCA<sub>Lerie</sub>, will be prepared. Ongoing monitoring of stream flows, water quality, sediment loading, phosphorus and nitrogen loadings continues to assess the impacts of several sediment removal techniques. Employment and Immigration Canada, Ontario Ministry of Environment and Energy, Long Point Region Conservation Authority, Lower Big Otter Remedial Project Committee, Port Burwell Special Levy, and local landowners are also supporting this project.

## 8.1 WHEATLEY HARBOUR PROJECTS

Wheatley Harbour is the only Area of Concern on the north shore of Lake Erie. Problems here are associated with bacterial contamination and contaminated sediments. The Stage 1 and 2 Remedial Action Plan documents are being finalized. This AOC could be delisted, or conditionally delisted, by 2001. The Great Lakes 2000 Cleanup Fund has supported one project with \$11,700 in support of the Wheatley Harbour RAP. With our partners' support, these projects have a total value of approximately \$30,000.

### SEDIMENT REMEDIATION

#### *8.1.1 Sediment Removal Demonstration*

Start Date: 1995                      Contact: Ian Orchard, Environment Canada  
Status:     On hold                      (416) 739-5874

Prior to initiating a proposed sediment removal demonstration project for Wheatley Harbour, samples were collected near the mouth of Muddy Creek. The samples were collected using the Eriksson method for freezing the samples *in-situ* and extracting the sediment in a frozen state to the surface. Analysis of the samples revealed the presence of heavy metals in excess of provincial sediment guidelines. A specially designed treatability study is being performed to determine the type and distribution of contamination and the physical properties of the sediment. A remediation plan will be developed according to the outcome of this study and future sampling results. This project was also supported by the Ontario Centre for Environmental Technology Advancement.



## 9.0 NIAGARA RIVER PROJECTS

The Niagara River is a boundary water between the United States and Canada. The Remedial Action Plan (RAP) for this site will be prepared separately for the Canadian and American sides of the river. Although the magnitude of the problem is greater on the U.S. side, the Canadian portion of the problem must be addressed in the interests of the Niagara River ecosystem. The Canadian Stage 2 Document has been completed and implementation is well underway, in the absence of an implementation framework. The Great Lakes 2000 Cleanup Fund has supported nine projects with more than \$2.6 million in support of the Niagara River RAP. With our partners' support, these projects have a total value of close to \$8 million.

### SEDIMENT REMEDIATION

#### *9.0.1 Sediment Removal - Welland River Full-scale Demonstration*

Start Date: 1994                      Contact: Ian Orchard, Environment Canada  
Status: Complete                      (416) 739-5874

Based on the success of the sediment removal and treatment demonstrations at the Atlas Specialty Steels Inc. site in the Welland River in 1991, a full-scale sediment remediation project was initiated. Atlas Specialty Steels Inc. acknowledged responsibility for metallic discharges to the Welland River and, in partnership with various government agencies, took the lead in developing and implementing remediation plans to remove 10,000 m<sup>3</sup> of contaminated material. The technology selected was an Amphibex dredge which operates under similar principles as the technology used in the pilot-scale demonstration. Partners include the Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Niagara River RAP, Atlas Specialty Steels Inc., Regional Municipality of Niagara, Niagara Peninsula Conservation Authority, and City of Welland.

#### *9.0.2 Sediment Removal - Welland River Pilot-scale Demonstration*

Start Date: 1991                      Contact: Ian Orchard, Environment Canada  
Status: Complete                      (416) 739-5874

A modified Mud Cat MC 915 ENV Dredge was used to remove moderately contaminated sediment from the Atlas Specialty Steels Inc. site on the Welland River, in November 1991. The modifications included changes to the auger head, boom, hull and hydraulic system. An instruments package comprising vibration and turbidity sensors was added to allow for dredge performance verification. Results showed that use of the modified dredge resulted in minimal sediment resuspension. The sediment slurry was transported in a floating and land-based flexible pipeline to the Atlas North Filtration Plant for pre-treatment by Acres International Limited/Derrick Environmental Services Corporation. The Ontario Ministry of Environment and Energy, and Atlas Specialty Steels Inc. also funded this project.

#### *9.0.3 Sediment Treatment - Welland River Pilot-scale Demonstration*

Start Date: 1991                      Contact: Craig Wardlaw, Water Technology International Corporation  
Status: Complete                      (905) 336-4691

A pre-treatment demonstration using sediment removed from the Welland River was conducted using a solids-liquids separation technique proposed by Acres International Limited/Derrick Environmental Services Corporation. A series of vibrating screens were used to separate the sediment by grain size. This pre-treatment and classification of the sediment substantially reduced the volume of sediment requiring further treatment. A similar technology will likely be used in the full-scale clean-up. This project was also supported by the Ontario Ministry of Environment and Energy, Atlas Specialty Steels Inc., and Acres International Limited/Derrick Environmental Services Corporation.

### URBAN RUNOFF

#### *9.0.4 Voluntary Participation in Reducing Extraneous Flows to Sewer Systems*

Start Date: 1993                      Contact: Ed Dujlovic, City of Niagara Falls  
Status: On hold                      (905) 356-7521 ext. 4220

Just as the "blue box" recycling program has led to an increased awareness of the need to reduce solid waste, this project aimed to bring about a similar awareness of individual contributions to water pollution. Removing extraneous flows to

STPs by disconnecting downspouts, reduced the production of wastewater and helped to optimize existing sewer infrastructure. In this way treatment capacity was "created", because wastewater was less diluted by extraneous flows. This has resulted in fewer overflows and bypasses to the natural environment. This project also reviewed municipal by-laws affecting disconnect programs and the success of disconnect projects in Ontario municipalities. Even though the City of Niagara Falls has a bylaw that requires downspout disconnect, only 60 to 70% of homeowners were actually disconnecting, even in areas where basement flooding occurred. A public education package was developed and presented with other display materials in the local mall; information was sent to homeowners. The final report will make recommendations for effective disconnect programs and also communicate results to other municipalities through a workshop. The City of Niagara Falls, Region of Niagara, and Ontario Ministry of Environment and Energy are also supporting this project.

## SEWAGE TREATMENT PLANT OPTIMIZATION

### *9.0.5 Fort George Constructed Wetland*

Start Date: 1994                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:    Ongoing                      (905) 336-6281

An innovative constructed wetland for addressing cold climate operation has been under evaluation for polishing sewage treated by the Niagara-on-the-Lake lagoon system. This experimental constructed wetland is of a sub-surface design with the flow being vertically fed in pulses. The treatment plant consists of a series of lagoons with a chemical added for the removal of phosphorus. The wetland will have a subsurface flow and an ability to 'drain down', which promotes the degradation of organic matter and removal of nutrients found in the treated sewage. Several years of data on phosphorus and nitrogen removal (as well as other treatment parameters) will be analysed this year and compiled in an engineering feasibility report by March 1997. This innovative approach is also funded by the U.S. Environmental Protection Agency, Region of Niagara, Ontario Ministry of Environment and Energy, and Friends of Fort George.

### *9.0.6 STP Comprehensive Technical Assistance*

Start Date: 1994                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:    Ongoing                      (905) 336-6281

Technical assistance has been provided to the Skyway sewage treatment plant in the Hamilton Harbour AOC and the Regional Municipality of Niagara STP in the Niagara River AOC to upgrade operations and document practices in a site-specific operations manual. The upgrading of operators skills is important in maintaining a consistent quality in the treated sewage on a day-to-day basis and in meeting the challenges of more stringent requirements for treated sewage. This project was also funded by Environment Canada's Technology Development Directorate, Ontario Ministry of Environment and Energy, and Regional Municipality of Halton.  
(Also refers to section 10.1.15)

## HABITAT REHABILITATION

### *9.0.7 Habitat Target Testing Strategy - Wetlands Targets Pilot Application - Niagara River AOC*

Start Date: 1996                      Contact: Wendy Leger, Environment Canada  
Status:    New                              (905) 336-4630

Suggested targets detailing wetland coverage within a watershed have been published in a report entitled "A Draft Framework for Guiding Habitat Rehabilitation in Great Lakes Areas of Concern". A methodology to incorporate these recommendations and provide a yardstick to measure the feasibility of these targets and their impact to the wetland habitat is now required. A variety of different mapping techniques (Ontario Ministry of Natural Resources wetland evaluation mapping, air photos, Landsat satellite imagery, soil maps, topographic maps), will be used to identify the status of wetlands in the Niagara River AOC. The selection of areas for potential wetland restoration will be based on analysis of a combination of factors such as: poorly drained soils, low permeability soils, water source availability (drain proximity of large enough overland drainage basin), proximity of other wetlands (for seed sources), and low conflict land use. The sum of the current wetlands, plus restorable vegetated and unvegetated lowlands included in both this plan and the upland habitat target planning study "Evaluation of Upland Habitat in the Niagara River AOC" will be compared to wetland targets by watershed and within the AOC. The plan's relative percentage of upland, mesic and lowland communities will be determined and compared to the original relative percentage by subwatershed to guide priority

setting for restoration initiatives. Colour maps for each task will be provided and recommendations will be made. Environment Canada's Water Issues Division and Conservation Strategies Division, Ontario Ministry of Environment and Energy, and Niagara Region Conservation Authority also contributed to this project.

#### *9.0.8 Options for Restoring Physical and Ecological Stability to the Welland River*

Start Date: 1995                      Contact: Doug Brown, Environment Canada

Status:    Ongoing                      (905) 336-4714

The Welland River, the largest tributary in the Niagara AOC, has been considerably altered since European settlement led to physical and ecological instability. This project is documenting and defining the extent of impairments on the River ecosystem, particularly the stream morphology, its floodplain and wetlands. Alternative strategies for restoring the physical and ecological stability of wetlands and fisheries habitat on a 132 km stretch of the River, will be developed and evaluated with regard to their impacts on water levels, flows and sedimentation. Follow-up monitoring and rehabilitation of the Welland Reef Clean-up site was initiated. The value of the Welland River wetlands, fisheries and other natural functions will be assessed and goals for restoring these communities will be identified. Environment Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Niagara Region, City of Welland, Niagara Peninsula Conservation Authority, Friends of the Welland, and Ontario Hydro are also supporting this project.

#### *9.0.9 Willoughby Marsh Hydrology/Hydrogeology Study for Habitat Rehabilitation*

Start Date: 1994                      Contact: Anne Yagi, Ontario Ministry of Natural Resources

Status:    On Hold                      (905) 892-2656

Willoughby Marsh is a provincially significant class 1 wetland, an Area of Natural and Scientific Interest and an Environmentally Sensitive Area. The Marsh and its tributaries provide habitat for many fish and wildlife species. Extensive municipal drainage systems surround the marsh. The water supply to the Marsh has been altered by the change in drainage patterns associated with the development of its watershed, resulting in significantly diminished water quality and loss of wetland and creek habitat. This project will improve fish and wildlife production in Willoughby Marsh, its tributaries and generally in the Niagara River AOC through the assessment and management of the hydrologic and hydrogeologic components of the habitat within the Marsh. The Ontario Ministry of Natural Resources, and Niagara River Conservation Authority are also funding this project.

### **RURAL NON-POINT SOURCE POLLUTION**

#### *9.0.10 Agricultural Implementation Strategy*

Start Date: 1994                      Contact: Chris Attema, Niagara Peninsula Conservation Authority

Status:    Ongoing                      (905) 227-1013 ext. 245

Contamination of the Welland and Niagara Rivers from agricultural areas may be a significant cause of degraded fish populations in these rivers. Implementation of an integrated watershed based approach that deals with all sources of rural water pollution is underway. Up to 50 hectares of no-till or conservation tillage "Best Management Practices" will be fully implemented, and up to 40 water quality improvement projects, based on the landowner contact program, will be initiated including 20 livestock fencing projects, 12 manure storage projects, 6 milkhouse washwater projects, and 1 constructed wetland septic project. Water quality monitoring is continuing to document environmental improvements. Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, Niagara Region Public Health Services, Niagara Peninsula Conservation Authority, Ontario Farm Environmental Coalition, Royal Bank, and local landowners are also funding this project.



## 10.0 LAKE ONTARIO PROJECTS

### HABITAT REHABILITATION

#### *10.0.1 Watershed Report Card - W.A.T.E.R.*

Start Date: 1996                      Contact: Les Stanfield, Ontario Ministry of Natural Resources  
Status:    New                              (613) 476-8777

Report Card type approaches aim at fostering community stewardship within a watershed context. This is achieved through education, motivation and involvement of concerned citizens as they apply the processes and techniques outlined in a user-friendly guide to inventory, assessment and remediation of watershed communities. Before proceeding to this stage, this project will evaluate the scientific validity of the Report Card by comparing it to data obtained by a professionally developed methodology with known reproducibility; recommendations will be formulated and revisions incorporated to the final version of the Report Card. The validity of the Silver Level modules for biological assessment, stream habitat and water quality assessment will be tested against the "Model for Predicting the Fish Community Structure and Salmonid Biomass in Southern Ontario Streams" at 32 sites in 6 to 10 subwatersheds. This project will not only, scientifically validate the use of non-professionally collected data for assessing and monitoring the health of watersheds, but also provide scientifically credible tools for assessment and monitoring that are relatively simple to apply yet provide meaningful and reproducible results. Other partners include Ontario Ministry of Environment and Energy, Ontario Ministry of Agri-Foods and Rural Affairs, Metropolitan Toronto and Region Conservation Authority, Lower Trent Conservation Authority, Moira River Conservation Authority, Save the Rouge Valley, Action to Restore a Clean Humber, Waring Creek Restoration Association, Salmon Creek Restoration Association, Wildlife Habitat Canada, Watershed Report Card Team, Council of Outdoor Educators, Canadian Heritage Rivers Secretariat, Ontario Association of Geography and Environmental Educators, Ontario Cattleman's Association, American Fisheries Society, Learning for Sustainability Partnership, Laidlaw Foundation, McLean Foundation, EcoScope, local schools, and numerous other sponsors.

#### *10.0.2 Martindale Pond / Henley Ecosystem Management Plan*

Start Date: 1996                      Contact: Cindy Toth, City of St. Catharines  
Status:    New                              (905) 688-5600 ext. 693

Martindale Pond is not a traditional Remedial Action Plan (RAP) Area of Concern, but it does have the endorsement of the Niagara River RAP. It is a provincial and federal priority wetland on the Great Lakes shoreline. The Pond's EMP has been modelled from the traditional RAP process. The project will rehabilitate the degraded ecosystem of Martindale Pond through innovative management of hydraulic flows and bioengineering to improve water quality and re-establish natural physical water processes in the watercourse. This will eliminate the need for a 30-year cycle of dredging. A total of 1.6 km of shoreline and 17.5 km<sup>2</sup> of fish and wildlife habitat will be enhanced by improving shoreline stability, providing erosion protection, enhancing fish habitat and improving water quality. Aquatic communities and hydrologic and water quality responses to the implemented changes, will be monitored. Project partners include Environment Canada, Public Works and Government Services Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Citizenship, Culture and Recreation, City of St. Catharines, Regional Municipality of Niagara, Niagara Peninsula Conservation Authority, PAC/adhoc, St. Catharines World Rowing Committee, Canadian Henley Rowing Corporation, St. Catharines Hydro-Electric Commission, and Ontario Hydro.

#### *10.0.3 Rehabilitate and Showcase Oshawa Second Marsh*

Start Date: 1993                      Contact: Nancy Patterson, Environment Canada  
Status:    Ongoing                              (416) 739-5824

Sustainable wetlands are important to the health of the Great Lakes ecosystem. They are vital to maintaining a productive fishery, providing valuable wildlife habitat, preventing erosion and flooding, and controlling point and non-point source pollution. The Oshawa Second Marsh is rare, since it is one of the few remaining Lake Ontario shoreline wetlands adjacent to a large urban centre. Habitat islands will be constructed to increase wildlife populations and biodiversity. In addition, re-opening the western outlet and removing the log jam from Farewell Creek will improve water circulation. Controls for purple loosestrife will be adopted and an interpretive centre will be created. Viewing towers have been installed at Scattergood and Harmony Ponds. Nesting boxes for ducks and bats have been installed throughout the Marsh. Environment Canada's Environmental Conservation Branch, and Environmental Partners

Fund/Action 21, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, City of Oshawa, Central Lake Ontario Conservation Authority, Oshawa Harbour Commission, Nature Conservancy of Canada, Wildlife Habitat Canada, Ducks Unlimited Canada, Friends of Second Marsh, Waterfront Regeneration Trust, Royal Botanical Gardens, Ontario Federation of Anglers and Hunters, Southern Ontario Big Game Hunters, Canadian Environmental Law Association, Second Marsh Defence Fund, National Campers and Hickers Association, National Sportsman's Show, Girl Guides of Canada, University of Guelph, Ontario Business College, Durham College, Separate School Board, Durham Board of Education, Courtice South Public School, Ontario Hydro, General Motors of Canada Ltd., Westmount Kiwanis, Motor City Kinsmen, Parkwood Rotary, Oshawa Rotary, Oshawa Central Lions Club, Canada Trust, Consumers Gas, Sportsman's Show, Kassinger Construction, R & M Construction, Landscape Concepts, Picov's Water Garden Nursery, Chalk Lake Greenhouses, Beejoun Research, Ste. Anne's Pure Spring Water, Roger's Cable TV, TV Ontario, McAsphalt Industries, R&M Construction, James Dick Ltd., and E.D.S. Canada are partners in this project.

## 10.1 HAMILTON HARBOUR PROJECTS

Hamilton Harbour is a heavily industrialized area at the western end of Lake Ontario. Problems include historically contaminated sediments, combined sewer overflows, and loss of fish and wildlife habitat. The Hamilton Harbour Remedial Action Plan (RAP) has completed its Stage 2 report which recommends a number of remedial options required to delist the Harbour as an Area of Concern (AOC). The Great Lakes 2000 Cleanup Fund has provided almost \$12.5 million in support of 31 projects for the Hamilton Harbour RAP. With our partners' support, these projects have a total value of more than \$32 million.

### SEDIMENT REMEDIATION

#### *10.1.1 PAHs in Hamilton Harbour: Contaminant Monitoring by Zebra Mussels*

Start Date: 1995                      Contact: Douglas Bryant, McMaster University  
Status:    Funding complete            (905) 542-2900  
             Project ongoing

To complement traditional monitoring methods in evaluating the success of the planned clean-up of Randle Reef, this project is developing methods to use Zebra Mussels as a biomonitor of sediment contamination, in particular polycyclic aromatic hydrocarbons (PAHs). The Ministry of Environment and Energy, McMaster University's Ecowise Project, and Tri-Council Ecoresearch Program are also supporting this project.

#### *10.1.2 Capping Contaminated Sediment*

Start Date: 1991                      Contact: Alex Zeman / Ian Orchard, Environment Canada  
Status:    Ongoing                      (905) 336-4882 / (416) 739-5874

It may be possible to reduce the toxic effects of contaminated sediments, left in place, by physically capping the area to isolate the contaminants. The feasibility and effectiveness of capping moderately contaminated sediments is being investigated at LaSalle Park in Hamilton Harbour where a sand cap was placed over sediments of intermediate toxicity. During the 1995 capping demonstration, a layer of clean sand was spread evenly over bottom sediment to the specified thickness ranging from 30 to 40 cm. Monitoring is being conducted to determine whether the sand cap is an effective barrier and a viable alternative to both the removal and disposal of dredged contaminated material. This project is also supported by Environment Canada's National Water Research Institute.

#### *10.1.3 Sediment Removal Demonstrations*

Start Date: 1991                      Contact: Ian Orchard, Environment Canada  
Status:    Various                      (416) 739-5874

10.1.3.1 In order to provide the EcoLogic Thermal Destructor sediment treatment demonstration with suitable sediment, a prototype Cable Arm Bucket was used to remove 25 m<sup>3</sup> of sediment from Sherman Inlet in Hamilton Harbour in 1991. (Complete)

10.1.3.2 Approximately 160 m<sup>3</sup> of sediment were removed from Randle Reef in Hamilton Harbour using the Cable Arm Clamshell bucket, in October 1992. Some of the sediment was treated in-place prior to its removal. The purpose of this demonstration was two-fold. First, the bucket was reconstructed based on recommendations from its Toronto demonstration. The on-site audit proved the technology's ability to decrease sediment resuspension and the operator was able to decant more water from the closed bucket. With an effective decanting mechanism, costs for transportation and sediment treatment are reduced. Secondly, this removal project provided both pre-treated (in-situ) and non-treated sediment to the Grace Dearborn bioremediation (land farming) treatment demonstration. The Hamilton Harbour Commission, Ontario Ministry of Environment and Energy, Regional Municipality of Hamilton-Wentworth, City of Hamilton, Stelco Inc., Dofasco Inc., and Environment Canada's Environmental Protection Branch also funded this demonstration. (Complete)

10.1.3.3 Planning is underway and negotiations with potential partners have begun to initiate a full-scale project to remove approximately 20,000 m<sup>3</sup> of contaminated sediment from Randle Reef. (Ongoing)



#### *10.1.4 Monitoring Sediment Clean-up Activities in Hamilton Harbour*

Start Date: 1995                      Contact: Murray Charlton /Ian Orchard, Environment Canada  
Status:    Ongoing                      (905) 336-4758 / (416) 573-5874

To evaluate the success of the sediment capping demonstration at LaSalle Park, a program to monitor sediment clean-up activities in Hamilton Harbour has been undertaken. Parameters being measured include winds, currents, surface wave elevation and water clarity. It is anticipated that the monitoring technology developed and tested during the LaSalle Park capping project will have application in future activities, such as the proposed Randle Reef clean-up. The National Water Research Institute also funded this project.

#### *10.1.5 Sediment Treatment Demonstrations*

Start Date: 1991                      Contact: Craig Wardlaw, Water Technology International Corporation  
Status:    Ongoing                      (905) 336-4691

10.1.5.1 The EcoLogic Thermal Destructor was tested at pilot-scale in Hamilton Harbour, following promising bench-scale testing using Hamilton Harbour, Thunder Bay and Sheboygan Harbour sediment. EcoLogic's process is based on the theory that hydrogen, in the gas phase at elevated temperatures, reacts with organic molecules to produce smaller, lighter and less toxic molecules. The demonstration resulted in the successful destruction of up to 99.9% of the polycyclic aromatic hydrocarbons (PAHs) in the sediment. This project was also funded by the Ontario Ministry of Environment and Energy, and Eli EcoLogic Inc. (Complete)

10.1.5.2 The Grace Dearborn bioremediation technology is characterized by the addition of proprietary organic amendments, low intensity tillage relative to other land farming processes and strict control of the water content of the material being treated. The organic amendment provides sites at which contaminants, nutrients, water and oxygen are all present, providing an ideal environment for the promotion of indigenous bacterial growth and contaminant destruction. The sediment was placed on a treatment area comprised of two successive layers of both sand and high density polyethylene liner to contain any mobilized contaminants. The demonstration has been completed, and over 90% of the PAHs in the sediment have been destroyed. In 1996, the treatment facility was decommissioned; all the sediments were tested and transported to a registered landfill. The Ontario Ministry of Environment and Energy, Grace Dearborn Inc., Stelco Inc., Regional Municipality of Hamilton-Wentworth, Hamilton Harbour Commission, Environment Canada's National Contaminated Sites Remediation Program, and Tallon Inc. also funded this demonstration. (Complete)

10.1.5.3 A search for all literature and data relating to contamination in Hamilton Harbour sediments is now complete. The purpose of this search was to ensure that all considerations have been taken into account before an expensive clean-up of the harbour is initiated. (Complete)

10.1.5.4 In preparation for a full-scale remediation project, a treatability study on sediment from the Dofasco boatslip has been completed. The sediment has been analyzed for grain size, density, water content, settling properties, and chemical contamination. An audit is currently being done of the Limnofix In Situ Treatment Technology for its application in the bioremediation portion of the project. A biological treatability study is now underway. (Ongoing)

#### *10.1.6 Transport Properties of a Connecting Ship Canal*

Start Date: 1993                      Contact: Paul Hamblin, National Water Research Institute  
Status:    Complete                      (905) 336-4921

One reason for high contaminant levels in AOCs such as Toronto, Collingwood and Hamilton Harbours, is the restricted mixing and transport between the AOC and the open lake due to local geometry. A mathematical model was developed to examine exchange flows between harbours and the Great Lakes. Because of the availability of extensive data, the model focused on the exchange between Hamilton Harbour and the Burlington Ship canal.

#### *10.1.7 In-Place Treatment of Contaminated Sediments*

Start Date: 1991                      Contact: Tom Murphy, National Water Research Institute  
Status:    Complete                      (905) 336-4602

Treating contaminated sediments in-place is being demonstrated as a potentially less expensive alternative to removal. Environment Canada's National Water Research Institute has developed and is demonstrating this technique. Sediment

toxicity is being treated in-place by injecting an oxidant into the sediment (either ferric chloride or calcium nitrate). Addition of the oxidant reduces the acute toxicity of the sediment and enhances bioremediation of organic contaminants in the sediment. The technique has been tested in St. Marys River and Hamilton Harbour. Positive results have been obtained in St. Marys River although long-term monitoring is still being carried out. The technique has also been tested at Laboratory scale using sediment from the Nipigon Bay AOC. Other collaborators include Environment Canada's National Water Research Institute, Great Lakes Preservation Fund, Ontario Ministry of Environment and Energy, Dofasco Inc., Stelco Inc., and Golder Associates.  
(Also refers to sections 2.1.1, 2.3.1 and 3.0.1)

#### *10.1.8 Contaminated Sediment Uptake in Waterfowl*

Start Date: 1990                      Contact: Donna Stewart, Environment Canada  
Status: Complete                      (416) 739-5825

Hamilton Harbour was declared an AOC due, in part, to its contaminated sediments. These sediments are frequently dredged for navigational purposes and stored in confined disposal facilities (CDFs). There is a concern for wildlife which come into contact with these sediments, especially the many species of migratory birds which temporarily reside on the Hamilton Harbour CDFs in autumn and spring. Two recent studies predicted that waterfowl in the Hamilton CDF will accumulate levels of polychlorinated biphenyls (PCBs) that will exceed human consumption guidelines (Canadian and U.S.). This project confirmed the elevated levels of chlorinated organic contaminants and metals in the tissues of domestic ducks which were released and recaptured on the CDF. Environment Canada's Environmental Conservation Branch also funded this project.

#### *10.1.9 Confining Sediments - Windermere Basin*

Start Date: 1990                      Contact: Simon Llewellyn, Environment Canada  
Status: Complete                      (416) 739-5839

In order to protect the functional integrity of an existing Confined Disposal Facility in Windermere Basin, a secondary dyke was constructed and a filter fabric/slope protection installed for the containment of dredged contaminated sediments. The Ontario Ministry of Environment and Energy, and Hamilton Harbour Commission also funded this project.

#### *10.1.10 Coal Tar Hot Spots*

Start Date: 1990                      Contact: Tom Murphy, National Water Research Institute  
Status: Complete                      (905) 336-4602

Coal tar "hot spots" in Hamilton Harbour contain levels of polycyclic aromatic hydrocarbons (PAHs) exceeding the RAP's interim standard of 200 ppm. This project determined the effects of PAHs on aquatic life and the areas of the Harbour where the problem is most severe. The results are being used to guide sediment remediation in the Harbour. Environment Canada's National Water Research Institute also supported this project.

### URBAN RUNOFF

#### *10.1.11 Real Time Control of Combined Sewer Overflows (CSOs)*

Start Date: 1991                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: Ongoing                      (905) 336-6438

In order to reduce the occurrence of CSO, the Regional Municipality of Hamilton-Wentworth will develop, implement, and evaluate a microcomputer-based Real Time Control system in cooperation with the Ontario Ministry of Environment and Energy and Great Lakes 2000 Cleanup Fund. The system will optimize the operation of the Region's combined sewage collection system (including sewers and several storage tanks) and reduce the number of overflows to local receiving water bodies.

### *10.1.12 Comprehensive Municipal Pollution Prevention Management Plan*

Start Date: 1993                      Contact: Tom Tseng, Environment Canada  
Status:     Complete                      (416) 739-5853

This plan is a tool by which pollution prevention can be used by the Regional Municipality of Hamilton-Wentworth to achieve the environmental goals determined by the Chairman's Task Force on Sustainable Development and the Hamilton Harbour RAP. The federal, provincial and municipal governments developed a model plan outlining the steps to municipal pollution prevention. The planning involved an inter-departmental and inter-disciplinary approach with preventative solutions to environmental problems and emphasised the integration of environmental solutions into the existing municipal structure. The project is based on the premise that municipalities, due to their close proximity and regulatory responsibilities, are positioned uniquely to influence and deliver environmental reform to their industrial, commercial and residential constituents. This project was also funded by Ontario Ministry of Environment and Energy, and Regional Municipality of Hamilton-Wentworth.

### SEWAGE TREATMENT PLANT OPTIMIZATION

#### *10.1.13 Envirotron - Ecowise Centre for Sustainable Communities*

Start Date: 1996                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     New                              (905) 336-6438

This project concept is based on: (i) using sewage nutrients (e.g. nitrogen, phosphorus) to grow aquatic plants; (ii) providing the opportunity of advanced research on the use of sewage as a resource and (iii) providing a showcase for education on sustainable community practices. Nutrients contained in sewage could be potentially utilized as a source of nutrients (e.g. nitrogen and phosphorus) for plants. However, there are various issues associated with such a concept before it could be realized at a reasonable scale. The feasibility study will address these issues which include sewage sources and characteristics, types of plants amenable to utilization of the sewage, environmental impacts, research benefits, public benefits and commercial viability. Partners in this project are McMaster University, Royal Botanical Gardens, and Ben Veldhuis Ltd.

#### *10.1.14 Evaluation of Secondary Clarifier - Burlington Skyway STP*

Start Date: 1996                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status:     Ongoing                      (905) 336-6438

Optimum clarifier performance will be required to achieve initial RAP phosphorus targets of 0.5 mg/L for the Skyway STP. The clarifiers remove suspended solids and its associated phosphorus before the treated sewage is discharged to Hamilton Harbour. Suspended solids are removed by the principle of settling. Improved settling in the Skyway STP clarifiers could be achieved by the use of baffles which provide more time for the solids to settle. One clarifier will be used as a test and baffles will be installed. Computer modelling will be used to simulate and predict the performance of various baffle configurations. Once the baffles are installed, the performance of the clarifier will be evaluated and compared to the modelling results. Partners in this project are the Ministry of Environment and Energy, and Regional Municipality of Halton.

#### *10.1.15 STP Comprehensive Technical Assistance*

Start Date: 1994                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Ongoing                      (905) 336-6281

Technical assistance has been provided to the Skyway Sewage Treatment Plant in the Hamilton Harbour AOC, and to the Regional Municipality of Niagara STP in the Niagara River AOC, to upgrade operations and document practices in a site-specific operations manual. The upgrading of operators' skills is important in maintaining a consistent quality in the treated sewage on a day-to-day basis and in meeting the challenges of more stringent requirements for treated sewage. Thanks to this project, initial RAP targets for phosphorus are being achieved at this STP. Environment Canada's Technology Development Directorate, Ontario Ministry of Environment and Energy, and Regional Municipality of Halton also funded this initiative.

(Also refers to section 9.0.6)



#### *10.1.16 Nitrogen Removal - Low Cost Nitrification*

Start Date: 1992                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Ongoing                      (905) 336-6281

Un-ionized ammonia in effluent must be reduced to 1-5 mg/L in order to meet Ontario Ministry of Environment and Energy requirements, so that the ultimate concentration of ammonia in the receiving waters is non-toxic to fish. This project identified low-cost processes (clarifier retrofit and fixed-film support media) for eliminating ammonia toxicity from municipal wastewater treatment plant discharges. Two approaches are being demonstrated at the Woodward Avenue and Waterdown STPs in the Hamilton Harbour AOC. This project was undertaken in cooperation with the Ontario Ministry of Environment and Energy, Municipal Engineers Association, Regional Municipality of Hamilton-Wentworth, and Environment Canada's Technology Development Directorate.

#### *10.1.17 On/Off Aeration Process Demonstration*

Start Date: 1994                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

On/off aeration is a technology which reduces energy costs and improves nitrification performance while achieving a reduction in nitrogen concentrations in municipal STP effluents. This technology will be evaluated in a preliminary fashion for the Dundas Sewage Treatment Plant in the Hamilton Harbour AOC and at full-scale for the Tillsonburg STP, outside of the AOC. The Dundas STP was not found to be easily amenable for a demonstration project. The Ontario Ministry of Environment and Energy, and Environment Canada's Technology Development Directorate also supported this project.

#### *10.1.18 Optimization of Precipitation and Coagulation in Activated Sludge Treatment - Skyway STP*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

This project established appropriate dosages, as well as, an operating strategy for chemical precipitation operation to reduce phosphorus discharges at the Skyway STP. The work was aimed at determining the requirements (chemical dosage and costs) for meeting initial RAP objectives for phosphorus in the Harbour. Ontario Ministry of Environment and Energy, and Regional Municipality of Halton also funded this project.

#### *10.1.19 Process Audit, Facility Plan, and General Purpose Simulator Implementation - Woodward STP*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

The Woodward Avenue STP, operated by the Regional Municipality of Hamilton-Wentworth, discharges 66% of the un-ionized ammonia and 40% of the phosphorus load to Hamilton Harbour. This project reviewed the performance of the Woodward Avenue STP, to identify process bottlenecks, and to evaluate options and costs for expanding the plant to meet initial and final RAP objectives. A customized and calibrated computer model of the STP was developed using specialized software, General Purpose Simulator (GPS), to assist in the evaluation of options. Collaborators include Ontario Ministry of Environment and Energy, and Regional Municipality of Hamilton-Wentworth.

#### *10.1.20 Step Feed Control at a Large STP - Woodward STP*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Complete                      (905) 336-6281

High flows caused by the infiltration of stormwater into the sewer system may cause process failure at municipal STPs. To prevent failure, many STPs bypass untreated wastewater during storms. A project to demonstrate an operating strategy, known as Step Feed Control, which minimizes plant bypassing, has been completed at the Woodward Avenue STP. The project demonstrated that a reduction in bypass volume greater than 90% could be achieved at minimal cost. The Ontario Ministry of Environment and Energy, and Regional Municipality of Hamilton-Wentworth also funded this project.

#### *10.1.21 Step Feed Control at a Small STP - Dundas STP*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

The objective of this project was to develop a wet weather operating strategy at a moderately sized municipal STP. The work was completed at the Dundas STP which discharges into Hamilton Harbour via Cootes Paradise. The project, a precursor to the work at the much larger Woodward Avenue STP (Project 10.1.20), demonstrated that step feed operation could avert plant failure during storm flows.

#### *10.1.22 Filtration Optimization and Process Control - Dundas STP*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

The Hamilton Harbour RAP requires a higher quality effluent from its STPs than can be achieved by conventional secondary treatment processes. This project examined the performance of an existing tertiary sand filter at the Dundas STP. The use of well-designed, high-rate tertiary filter systems will reduce capital costs, improve the response to variations in loadings, and decrease the total concentration of suspended solids. The Dundas tertiary filter is efficient under normal operating conditions, but does not have much reserve capacity to handle increased hydraulic or solids loading. Partners in this initiative include the Ontario Ministry of Environment and Energy, and Regional Municipality of Hamilton-Wentworth.

#### *10.1.23 Enhanced Process Audit - Skyway STP*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

The true capacity and capability of the Skyway STP for meeting the RAP's proposed target loadings was established through this project. This was necessary to ensure that decisions to upgrade the facility are economically and technically sound. The process audit has been completed and the recommendations for the most cost- and performance-effective plant upgrading requirements are currently being implemented. The Water Technology International Corporation, and Regional Municipality of Halton also funded this project.

#### *10.1.24 Hydraulic Parameters Assessment - Skyway STP*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

This project examined hydraulic conditions in a typical activated sludge wastewater treatment process in order to demonstrate the importance of good hydraulic design for chemical coagulation and flocculation operations. This in turn, led to recommendations for improving the efficiency of the Skyway STP to improve effluent quality with respect to suspended solids and phosphorus and/or improvement in the efficiency of chemical use.

#### *10.1.25 Assessment of the Presence of PAHs in the Woodward STP*

Start Date: 1992                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

Significant levels of polycyclic aromatic hydrocarbons (PAHs) have been found in the sediments of Hamilton Harbour. The depositions have been attributed to a variety of sources. Generally, STPs have shown a minimal incidence of PAHs in sewage and treated effluent. However, the Woodward Avenue STP receives coke plant wastewaters from a steel mill containing significant levels of PAHs. The removal of PAHs at the Woodward Avenue STP was investigated and the average removal was found to be 98.3 %.

## HABITAT REHABILITATION

### *10.1.26 Grindstone Creek Watershed Study*

Start Date: 1996                      Contact: Robert Edmondson, Halton Region Conservation Authority  
Status:     New                                      (905) 336-1158

Two of the major watersheds which drain into Hamilton Harbour are the Spencer and Grindstone Creeks. Under separate funding, the Halton Region Conservation Authority initiated a Watershed Study for Spencer Creek. A coordinated approach for both these watersheds is required to provide the appropriate guidance for the protection of the Hamilton Harbour watershed. A Watershed Study for Grindstone Creek was therefore initiated. It will provide a summary of the work undertaken during Phase I of the preliminary investigations and their preliminary conclusions. The summary will include an annotated bibliography of the background reports to the Grindstone Creek watershed comprising benthic, fisheries and erosion data. In addition, the Terms of Reference will be finalized, a Public Consultation Process will be developed, and recommendations for further studies and inventories will be made. Project Partners include Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Regional Municipality of Hamilton-Wentworth, Regional Municipality of Halton, City of Burlington, Town of Flamborough, Halton Region Conservation Authority, Royal Botanical Gardens, and Environmental Youth Corp.

### *10.1.27 Floating Cattail Rafts for Black Terns*

Start Date: 1995                      Contact: Mark Taylor, Geomatics International  
Status:     Ongoing                                      (905) 632-4259

Restoration of the biodiversity of marsh species in Cootes Paradise is one of the top priorities of the Hamilton Harbour RAP. In addition to testing this technique as a means of re-establishing emergent vegetation in the marsh, this project will investigate the technique of creating floating cattail rafts as a habitat rehabilitation method for the threatened black terns, and to encourage the return of other wetland species. Twenty vegetated rafts were constructed and deployed in Cootes Paradise. Vegetation growth and wildlife use of the rafts will be monitored to determine the success of the rafts as a breeding habitat for marsh birds. These activities are continuing. The project will also assess the feasibility and viability of these methods for re-establishing emergent vegetation in wetlands. Environment Canada's Environmental Conservation Branch, Fisheries and Oceans Canada, Royal Botanical Gardens, Hamilton Naturalists, Geomatics International, and Canada Trust are also funding this project.

### *10.1.28 Fish and Wildlife Habitat Rehabilitation*

Start Date: 1991                      Contact: Vic Cairns, Fisheries and Oceans Canada  
Status:     Ongoing                                      (905) 336-4862

Rehabilitation of fish and wildlife communities in Hamilton Harbour is a 3-part process, it begins with reducing existing stressors, rehabilitating and creating suitable fish and wildlife habitat, and, finally, restructuring fish and wildlife populations. Major program elements include: rehabilitating the 277 ha wetland in Cootes Paradise; rehabilitating 16.3 km of riparian habitat; enhancing the existing pike spawning marshes on Grindstone Creek; improving littoral and deep water habitats along the southwest shore of the Harbour; softening existing hard shores at LaSalle Park and the Canada Centre for Inland Waters; and, creating islands at these two sites to provide sheltered embayments, erosion protection, shallow water fish habitat, colonial waterbird nesting and loafing habitats, and feeding habitat for waterfowl. The carp barrier and fishway delivered 250 ha of wildlife habitat and 1 km of new littoral habitat. The project has a large public participation component; the construction of trails, boardwalks, wildlife viewing platforms, and an information centre are enhancing opportunities for access and education. Monitoring is already showing a significant increase in the numbers of fish and fish species using the newly created habitats. The northeastern shoreline islands have attracted over 200 pairs of Caspian and common terns. A dramatic increase in young-of-the-year large mouth bass has been observed at La Salle Park. Activities continue at the Northeastern shoreline (ring billed prevention program, fish nodules, landscaping...) and on the Bayfront to Desjardins Canal Project - west Harbour site (final design preparation and environmental assessment). To date, Environment Canada's Environmental Conservation Branch, Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Regional Municipality of Hamilton-Wentworth, Regional Municipality of Halton, City of Hamilton, City of Burlington, Halton Region Conservation Authority, Hamilton Region Conservation Authority, Hamilton Naturalists, Hamilton Harbour Commissioners, Royal Botanical Gardens, Waterfront Regeneration Trust, Environmental Partners Fund, LaSalle



Marina Association, Burlington Boating and Sailing Club, McMaster University, Brock University, and a large number of private and corporate citizens who gave through Project Paradise, have contributed resources to the project.

#### *10.1.29 Colonial Waterbirds Relocation*

Start Date: 1993                      Contact: Hans Blokpoel, Environment Canada

Status:     Ongoing                      (613) 952-2410

The Caspian tern has few breeding colonies in Canada. A new colony has recently been established in Hamilton Harbour and offers the Fish and Wildlife Rehabilitation Project an opportunity to ensure this large and attractive bird remains part of the avifauna of the area. The colonized nest site is on a pier planned for industrial uses, therefore, an alternative nesting site will eventually be needed. This project will evaluate a technique for relocating the Caspian tern, common tern, black-crowned night heron, and double-crested cormorant colonies, nesting at the site prior to the construction of the nesting islands; a management plan will also be implemented. The number of Caspian tern pairs on the raft increased from 1 in 1993 to about 50 in 1995. These islands will also serve other fish and wildlife habitat functions. Both field work and monitoring activities are continuing and a report on the evaluation and effectiveness of the colonial waterbirds relocation techniques, including recommendations for improvement will be produced. An updated Fact Sheet for the Caspian Tern project (Hamilton Harbour) will also be produced. Environment Canada's Environmental Conservation Branch, and Halton Region Conservation Authority are also supporting this project.

#### *10.1.30 Towards a Greenlands Strategy*

Start Date: 1995                      Contact: Mary Ellen Scanlon, Regional Municipality of Hamilton-Wentworth

Status:     Funding complete                      (905) 546-4348  
                 Project ongoing

A Greenlands Strategy is being implemented to support and nurture fish and wildlife habitat rehabilitation and restoration activities within the Hamilton Harbour watershed and contribute to human and ecosystem health through the protection, conservation and enhanced management of habitat. Detailed mapping has been developed for establishment and protection of the Greenlands System, a network of linkages between natural areas, for the Regional Municipality of Hamilton-Wentworth. A monitoring framework is being established for land use activities and ecological functions. This project is one of the first tests of the goals of the Natural Heritage System Approach for RAPs. The Ontario Ministry of Natural Resources, and Regional Municipality of Hamilton-Wentworth also funded this project.

### RURAL NON-POINT SOURCE POLLUTION

#### *10.1.31 Hamilton Harbour Watershed Stewardship*

Start Date: 1994                      Contact: Jo-Anne Rzadki, Hamilton Region Conservation Authority

Status:     Ongoing                      (905) 525-2181 ext. 164

This project intends to protect, enhance, and restore the streams and environmentally significant natural areas of the Hamilton Harbour watershed by informing, educating private landowners about the natural significance of their properties, showing them the relationship with Hamilton Harbour downstream, and empowering them to become stewards of their land and water. Approximately 1200 landowners owning property along a stream, or in an environmentally significant natural area in the Spencer and Grindstone Creek subwatersheds above the Niagara Escarpment will be contacted. Soil erosion and other problems in the watershed will be remediated, thereby reducing and in many cases eliminating nutrient and bacterial pollution. This will directly benefit Spencer Creek by improving cold water fishery habitat and providing cleaner water for the Valens Conservation Area. Examples of project activities to be conducted include: livestock fencing and alternate water supply; stream and wetland buffer strip plantings; manure storage and milkhouse waste facility improvements; conservation tillage; native tree, shrub and wildflower plantings; removal of exotic and invasive species; habitat enhancement projects for specific wildlife species and correction of erosion problems. The total number of stewardship agreements made to date is 135, resulting in securement of 41.6 km of stream and protection of 1071.6 ha of significant areas; outside of the agreements, 11 ha of land and 3 km of riparian habitat were rehabilitated. Environment Canada's Environmental Partners Fund, Ontario Ministry of Natural Resources, Clean-up of Rural Beaches, Hamilton Region Conservation Authority, Halton Region Conservation Authority, The Richard Ivey Foundation, Hamilton Foundation, Laidlaw Foundation, Canada Trust's Friends of the Environment Foundation, and Bay Area Restoration Council are also funding this project.

### *10.1.32 Remediation of Agricultural Pollution*

Start Date: 1994                      Contact: Libor Michalak, Hamilton Region Conservation Authority

Status:    Complete 1995                      (905) 525-2181

This project tested techniques to capture and prevent agricultural runoff and reduce non-point source contamination into Westover Creek, a tributary of Spencer Creek within the Hamilton Harbour watershed. At one problem site, a walled and bermed manure pad with a collecting well for liquids, eavestroughing for the barn, fencing, and a circular tank for liquid storage was built. Agriculture and Agri-Food Canada, Ontario Ministry of Agriculture, Food and Rural Affairs, Clean-up of Rural Beaches, Hamilton Region Conservation Authority, Halton Region Conservation Authority, Association of Conservation Authorities of Ontario, Bay Area Restoration Council, Ontario Soil and Crop Improvement Association and landowners are also supporting this project.

## 10.2 METROPOLITAN TORONTO AND REGION PROJECTS

The Metropolitan Toronto and Region RAP aims to restore water quality in the six watersheds that drain into the waterfront, as well as the waterfront itself. The Stage 2 Report is complete and implementation is in progress. Projects in this AOC address all of the Great Lakes 2000 Cleanup Fund's priorities. The Great Lakes 2000 Cleanup Fund has supported 56 projects with more than \$6.9 million. With our partners' support, these projects are worth over \$21 million.

### SEDIMENT REMEDIATION

#### *10.2.1 Grenadier Pond - Feasibility of Sediment Treatability*

Start date: 1995                      Contact: Ian Orchard, Environment Canada / Murray Boyce, City of Toronto  
Status: Ongoing                      (416) 739-5874 / 392-7264

As part of a long-term rehabilitation strategy for Grenadier Pond, options to improve sediment quality and allow a more natural regime of water level fluctuations are being investigated. Pending the results of sediment characterization and a treatment feasibility study, remediation of sediments in the southwest portion of the Pond will commence.

#### *10.2.2 Sediment Removal Demonstrations*

Start Date: 1992                      Contact: Ian Orchard, Environment Canada  
Status: Complete                      (416) 739-5874

10.2.2.1 In order to prepare the location for Scarborough's Dunker's Flow Balancing System, an innovative sediment removal technology was demonstrated at the Bluffers Park site in the spring of 1995. The technology used was the Amphibex. Approximately 45,000 m<sup>3</sup> of marginally contaminated sediment were removed to create the Dunker's cells.

10.2.2.2 In June 1992, a Cable Arm 100E Bucket owned by L.B. Tanker Inc. removed nearly 250 m<sup>3</sup> of contaminated sediment at the Parliament Street Slip of Toronto's Inner Harbour. The Cable Arm is a precision, sealed clamshell bucket that removes the layer of contaminated material without digging a hole as a conventional bucket would. The Cable Arm demonstration was successful in removing sediment with minimal disturbance of the water column. Sediments containing up to 70 % solids were transferred to a transport barge and taken to the Toronto Harbour Commissioners' Soil Recycling Facility for treatment. This demonstration was conducted with the support of the Metropolitan Toronto and Region Conservation Authority, Royal Canadian Yacht Club, Toronto Harbour Commissioners, and Environment Canada's Environmental Protection Branch.

10.2.2.3 In the summer of 1993, a remote-operated vehicle was used to survey the sediments of Spadina Marina and Harbour Square Park. These sites were selected for a potential sediment removal demonstration. Sediment samples from these areas were submitted for chemical analysis. In addition, a workshop was held in co-operation with the RAP team to discuss needs and options available for a removal and treatment demonstration.

#### *10.2.3 Sediment Treatment Demonstrations*

Start Date: 1992                      Contact: Craig Wardlaw, Water Technology International Corporation  
Status: Complete                      (905) 336-4691

10.2.3.1 Approximately 100 m<sup>3</sup> of sediment removed from the Parliament Street Slip were treated at the Toronto Harbour Commissioners' (THC) Soil Recycling Facility. The treatment was a three step process, which began with Bergmann's soil washing, followed by Metanetix metals removal, and SNC bioremediation. Overall, the demonstration showed that the THC facility reduced metals and organic contaminant concentrations in fine-grained sediment. The demonstration was conducted in conjunction with the Toronto Harbour Commissioners, and SNC-Lavalin.

10.2.3.2 A treatability study was conducted on sediment from an embayment at Bluffers Park in Scarborough. Testing focused on whether the sand fraction of the sediment removed for the Dunker's Flow Balancing System could be removed and used for clean fill. The estimated time for de-watering of the sediment without mechanical aid was also determined.



#### *10.2.4 Positioning System for Dredging Technologies*

Start date: 1994                      Contact: Ian Orchard, Environment Canada  
Status:    Complete 1996                      (416) 739-5874

In 1995, at Ontario Hydro's Pickering Nuclear Generating Station, the Cable Arm Bucket was used in its first commercial application. To enhance the accuracy of the clamshell bucket dredge, a 'z' (3 Dimensional) positioning system was developed and tested. By improving the accuracy of removal, a 'z' coordinate positioning system should require less handling of removed material, thereby reducing overall costs of full-scale projects. Environment Canada's Remediation Technologies Program provided scientific and technical advice during the operation. This project was also supported by Ontario Hydro.

(This also refers to section 10.0.3.2)

This demonstration provided data with which to establish operating parameters for future full-scale removal projects, such as Randle Reef in Hamilton Harbour (*See Hamilton Harbour Projects - Sediment Removal Demonstrations, Project 10.1.3.3*).

#### URBAN RUNOFF

#### *10.2.5 Septicity Evaluation Study for Western Beaches Storage Tunnel*

Start Date: 1996                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:    New                                      (905) 336-6281

The Western Beaches Storage Tunnel will store up to 95,000 m<sup>3</sup> of combined sewer overflows that are currently discharged from 12 outfalls to the shoreline of the Toronto Western Beaches. To improve the efficiency of operation, the potential for septic conditions must be examined. This study will: determine whether septicity is likely to develop under extended detention periods, identify options for controlling/eliminating septicity and monitoring requirements, and develop contingency plans, in the event of septicity. A review of experiences from other municipalities with tunnels will be conducted, as well as, Laboratory studies on Western Beaches CSOs. Partners are the Ontario Ministry of Environment and Energy, and City of Toronto.

#### *10.2.6 Evaluation of Roadside Ditches and Other Related Stormwater Management Practices*

Start Date: 1995                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:    Ongoing                                      (905) 336-6281

The traditional practice of roadside ditches in rural areas may offer advantages over the curb-gutter-sewer system of urban areas by providing some level of stormwater quality and quantity management. This project investigated the environmental, social and economic issues associated with the use of roadside ditches and alternative road drainage systems. The report is currently being finalized. This project is also supported by Ryerson Polytechnic University, Metropolitan Toronto and Region Conservation Authority, and Lake Simcoe Region Conservation Authority.

#### *10.2.7 Stormwater Assessment Monitoring and Performance Program (SWAMP)*

Start Date: 1994                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status:    Ongoing                                      (905) 336-6438

Many technologies for the treatment of stormwater are being piloted or demonstrated in the Metropolitan Toronto and Region AOC. There is a need to monitor and evaluate these technologies for their effectiveness. The Stormwater Assessment Monitoring and Performance Program was initiated to collect this information and to provide recommendations for improving operations, design and monitoring of such technologies. Specific projects assessed to date are the Ontario Ministry of Transportation's Highway 401/Rouge River Stormwater Management Facility, Harding Park Stormwater Pond and the City of Toronto's Eastern Beaches Storage Tank. This project is carried out in partnership with the Ontario Ministry of Environment and Energy, Ontario Ministry of Transportation, City of Etobicoke, City of Scarborough, a number of municipalities, and Metropolitan Toronto and Region Conservation Authority.

### *10.2.8 Etobicoke Exfiltration System*

Start Date: 1993                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: Ongoing                      (905) 336-6438

Innovative methods for exfiltrating stormwater to groundwater will be evaluated, as part of a storm sewer system replacement. The City of Etobicoke and Ontario Ministry of Environment and Energy are bearing the full cost of construction of the system. The final report is currently in preparation. The Great Lakes 2000 Cleanup Fund support is directed to the evaluation components of the project.

### *10.2.9 Mobile High Rate CSO Treatment Demonstration*

Start Date: 1993                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: Ongoing                      (905) 336-6438

A mobile High Rate Treatment Facility for CSO control is being demonstrated at a site in Scarborough. Treatment technologies demonstrated to date are vortex separation (with and without chemicals), vortex separation with filtration, parallel plate separations, and micro-screens. For situations where the CSO discharge needs to be disinfected, treated CSO samples were also subjected to ultraviolet disinfection tests (collimated beam tests). The project is also funded by the City of Scarborough, Regional Municipality of Metropolitan Toronto, and Ontario Ministry of Environment and Energy.

### *10.2.10 Metropolitan Toronto Waterfront Receiving Water Model Development*

Start Date: 1993                      Contact: Michael D'Andrea, Ontario Ministry of Environment and Energy  
Status: Ongoing                      (416) 235-6226

To carry out remedial works in a well planned and coordinated fashion, the City of Scarborough, City of Etobicoke, City of Toronto, Ontario Ministry of Environment and Energy and Regional Municipality of Metropolitan Toronto have developed a computer model to permit the assessment of remedial options. The model will assist in: establishing effluent limits for various waterfront discharges; evaluating alternatives and their effectiveness as part of the environmental assessment process; and developing preliminary design and site selection of remedial works along the waterfront.

### *10.2.11 Scarborough Assessment of Water Quality Improvement Options-Dunker's Flow Balancing System*

Start Date: 1992                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status: Ongoing                      (905) 336-6281

An environmental assessment was conducted on alternative stormwater quality control methods for the City of Scarborough. One innovative method considered was the Dunker's Flow Balancing System. This system consists of a series of cells in a water body, which detain polluted stormwater and allow for sedimentation. The assessment was carried out in cooperation with the City of Scarborough, Ontario Ministry of Environment and Energy and Great Lakes 2000 Cleanup Fund. The Dunker's facility is currently under construction. In 1996/97, a project centering around public education on the Stormwater Quality Control Demo Facility was initiated. The activities entail production of a video, establishment of a home page on the Internet and design of an interpretive centre. The Great Lakes 2000 Cleanup Fund's Sediment Removal program helped to prepare the site for the Dunker's system by removing sediment using an innovative technology, known as the Amphibex. (see section 10.2.2 *Sediment Removal Demonstration*)

### *10.2.12 Emery Creek Stormwater Retention Pond*

Start Date: 1991                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: On hold                      (905) 336-6438

The Great Lakes 2000 Cleanup Fund will assist in the pre-design and environmental assessment of a stormwater retention pond, in cooperation with the Ontario Ministry of Environment and Energy and the Regional Municipality of Metropolitan Toronto. Emery Creek, the demonstration site, drains a large industrial catchment. The pond will detain stormwater and allow solids to settle out and industrial spills to be retained. The pre-design report is being finalized. Once the pond is constructed by the Regional Municipality of Metropolitan Toronto, the Great Lakes 2000 Cleanup Fund will assist in the evaluation of its performance for remediating urban runoff problems.

### *10.2.13 Markham Stormwater Best Management Practices*

Start Date: 1991                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status:     Ongoing                      (905) 336-6438

Innovative stormwater management techniques were evaluated in stages for a number of sites in Markham. A retrofit of an existing stormwater pond was found to be the most practical solution for managing stormwater. The stormwater pond is currently under construction. Partners in the project are the Ontario Ministry of Environment and Energy, and Town of Markham.

### *10.2.14 High Rate Treatment - Toronto*

Start Date: 1991                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status:     Complete                      (905) 336-6438

This project is being carried out at the North Toronto Sewage Treatment Plant, which contributes significant combined sewer overflows (CSOs) to the Don River. Design approaches for High Rate Treatment will be developed, installed, demonstrated and evaluated by the Regional Municipality of Metropolitan Toronto, Ontario Ministry of Environment and Energy and Great Lakes 2000 Cleanup Fund. Possible devices include: storage, vortex separator, ultraviolet disinfection, chemical addition and chlorination-dechlorination. The project is currently at the design stage, but has been postponed until the results of the *Mobile High Rate CSO Treatment Demonstration* (Project 10.2.9) are made available.

### *10.2.15 Living Machine - Ontario Place*

Start Date: 1995                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

Many swimming beaches have to be closed after storms due to the inputs of high concentrations of coliform bacteria which cause a health hazard to swimmers. A technical and cost study was completed to determine whether a Living Machine at Brigantine Cove, Ontario Place, would remove the harmful bacteria and thereby maintain the swimming quality of the beach. The Living Machine is made up of a series of reactors in which micro-organisms, including useful bacteria, plants (i.e. reeds and rushes), snails and clams, remove pollutants from the incoming water. This project was also funded by the Ontario Ministry of Environment and Energy.

### *10.2.16 Green Barrel Project - City of Toronto*

Start Date: 1994                      Contact: Wayne Green, City of Toronto  
Status:     Complete                      (416) 392-7674

In a new pilot project to control urban stormwater runoff, the City of Toronto distributed 150 rain barrels in conjunction with a downspout disconnection program to volunteer homeowners. Response from homeowners was overwhelming and a waiting list for future barrels has been created. The rain barrels store rainwater which would otherwise discharge onto the grass around the home. The objective was to divert storm flow from the sewer system, reducing the discharge of combined sewer overflows and pollutants into Lake Ontario and the Humber and Don Rivers. The diversion results in improved water quality, cleaner beaches, a reduced load on the sewage treatment plant and a reduced risk of basement flooding. Since the stored water serves as an alternate source of water for outdoor use on lawns and gardens, demand for treated municipal water is also reduced. The Ontario Ministry of Environment and Energy, and City of Toronto also funded this demonstration.

### *10.2.17 Etobicoke's Rain Barrel Program*

Start Date: 1994                      Contact: Jennifer Smysnyuk, City of Etobicoke  
Status:     Complete                      (416) 394-8377

The City of Etobicoke initiated an innovative pilot project to control urban stormwater runoff. The distribution of rain barrels to volunteer residents conveyed the message that stormwater should be managed as a resource. The rain barrels help to reduce the rate of stormwater runoff thus reducing its impacts. The barrels were manufactured in Etobicoke using recycled plastic. The added benefit of retaining stormwater is that demand for treated municipal water may be reduced. The Ontario Ministry of Environment and Energy, and City of Etobicoke also funded this demonstration.



### *10.2.18 Development of Ultraviolet Disinfection for Beach Protection*

Start Date: 1992                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status:     Complete                      (905) 336-6438

Many beaches in the Toronto area and elsewhere are closed due to the health hazard presented by contamination from faecal bacteria. Beach protection systems have been used only a few times in southern Ontario. The potential of applying ultraviolet disinfection lamps to maintain a swimming beach on the Great Lakes is not known. This project identified requirements for UV disinfection technologies for beach protection at a proposed beach on the Toronto Waterfront. Beach protection measures are considered temporary, and not a substitute for remedial actions to control sources of contamination.

### *10.2.19 Stormwater Ponds - Assessment and Removal of Contaminated Sediment*

Start Date: 1992                      Contact: Jiri Marsalek, National Water Research Institute  
Status:     Complete                      (905) 336-4899

Urban runoff is recognized as a significant source of solids, nutrients, faecal bacteria, heavy metals and persistent toxic substances. Stormwater ponds are commonly used to reduce the impacts of urban runoff. These ponds are particularly effective in trapping stormwater sediment which may be contaminated. The sediment in four stormwater ponds in the Toronto area was studied by field surveys. Samples of suspended and settled sediment have been analyzed for a number of chemical parameters specified in the OMOEE Guidelines, including metals and organochlorine pesticides. The ecotoxicity of these samples was also tested. The goal of this project was to provide recommendations for environmentally-safe pond maintenance procedures, including the need for, and frequency of, sediment removal, and acceptable sediment disposal practices. Results indicate that metals in the pond sediment frequently exceed the "lowest effect" levels specified in the Guidelines, but rarely exceed the "severe effect" levels. Investigations of bottom sediments, suspended particulates and their extracts revealed the presence of promutagens. Sediment ecotoxicity will require further investigations. This project was cooperatively undertaken by Environment Canada's National Water Research Institute, Ontario Ministry of Environment and Energy, Metropolitan Toronto and Region Conservation Authority, and City of Scarborough.

### *10.2.20 How Much is Clean Water Worth?*

Start Date: 1990                      Contact: Ray Rivers, Environment Canada  
Status:     Complete                      (905) 336-4949

The feasibility of water pricing and its effects on water use and conservation were determined. It investigated the potential for water efficiency and conservation programs to save water, compensate for system inadequacies, decrease wastewater flows, reduce demands, and extend the use of existing infrastructure. This project was carried out in partnership with the Regional Municipality of Metropolitan Toronto.

## **SEWAGE TREATMENT PLANT OPTIMIZATION**

### *10.2.21 Sludge Characterization for Organics*

Start Date: 1995                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

Sewage sludge samples were analyzed for organic contaminants and heavy metals. Various Canadian municipalities (including Metropolitan Toronto) participated in the study. The report has been finalized and the data provides the most comprehensive data set on organics and metals for the Province of Ontario. The Regional Municipality of Metropolitan Toronto also funded this project.

### *10.2.22 Main STP Audit and Implementation of General Purpose Simulator (GPS)*

Start Date: 1992                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

The Main STP, operated by the Regional Municipality of Metropolitan Toronto, is the largest STP facility in Ontario. Consequently, changes in effluent objectives or limits will have significant cost implications. An evaluation of the Main STP was undertaken to determine the operational status of the facility in the areas of effluent quality, treatment capacity,

and the presence of process bottlenecks. A computer simulation package, General Purpose Simulator (GPS), was customized and calibrated to provide a tool for optimizing plant operations. The report indicated that no plant expansion was needed to achieve the nitrogen objective but that aeration system upgrading is required. The project was also funded by the Ontario Ministry of Environment and Energy, and Regional Municipality of Metropolitan Toronto.

#### *10.2.23 Oil from Sludge*

Start Date: 1991                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: Complete                      (905) 336-6438

This project was to demonstrate the oil from sludge technology at the Highland Creek Sewage Treatment Plant. This technology produces oil which could be used as fuel. In 1994, a final engineering design was completed for a full-scale demonstration plant. However, for this particular situation, the costs were considered by the Regional Municipality of Metropolitan Toronto to be too high. Subsequently, the project was terminated. Partners contributing support were Regional Municipality of Metropolitan Toronto, and SNC-Lavalin.

### HABITAT REHABILITATION

#### *10.2.24 Milne Dam Fishway*

Start Date: 1996                      Contact: Mark Heaton, Ontario Ministry of Natural Resources  
Status: New                              (905) 713-7406

This project will design and construct an engineered fishway at the Milne Reservoir (Town of Markham) to de-fragment fisheries habitat in the Rouge River watershed and rehabilitate the aquatic community of the Rouge River ecosystem as part of the Metropolitan Toronto Remedial Action Plan. Over 50 km of riparian habitat will be reconnected as a result of implementing the project plan. This will promote self-sustaining fish populations consisting of cold and warm water fish communities, including brook trout, rainbow trout, reidside dace, smallmouth bass and largemouth bass. This project will also develop a public education initiative on the impact of dams and serve as a successful and well documented demonstration site for promoting local community stewardship for the watershed. Funding is also provided by the Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Town of Markham, Metropolitan Toronto and Region Conservation Authority, Friends of the Environment Fund, Ontario Streams, Save the Rouge, Rouge Park Alliance, Metro East Steelheaders and Salmon Fishermen, and Izaak Walton Fly Fishers' Club.

#### *10.2.25 Palgrave Dam Fish Habitat Restoration*

Start Date: 1996                      Contact: Mark Heaton, Ontario Ministry of Natural Resources  
Status: New                              (905) 713-7406

This project will initiate an assessment process for mitigating the impacts of the Palgrave Dam on the Humber River and its aquatic ecosystem. Rehabilitation techniques to restore at least 4 km of riparian cold water fish habitat (brown trout, brook trout, reidside dace), will be developed to improve water quality, aesthetics and attain a self-sustaining cold water fishery within the Humber River watershed. This project will also serve as a successful and well documented demonstration site for promoting local community stewardship for the watershed. Funding will also be provided by the Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Town of Caledon, Metropolitan Toronto and Region Conservation Authority, Friends of the Environment Fund, Ontario Streams, Action to Restore a Clean Humber, and Izaak Walton Fly Fishers' Club.

#### *10.2.26 Rouge Headwaters Aquatic Habitat Rehabilitation - Elgin East Section*

Start Date: 1996                      Contact: Mark Heaton, Ontario Ministry of Natural Resources  
Status: New                              (905) 713-7406

Restoration of 3 km of cold water fish habitat will be undertaken in an urban headwaters section of the Rouge River that has a demonstrated carrying capacity for brook trout and for the provincially significant reidside dace. Monitoring of benthic and fish communities will be carried out to assess the success of the project. This project will also serve as a successful and well documented demonstration site for promoting public education and local community stewardship of municipally owned natural aquatic features within the Elgin East community in Richmond Hill. Funding was also provided by the Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Town of

Richmond Hill, Metropolitan Toronto and Region Conservation Authority, Friends of the Environment Fund, Ontario Streams, Save the Rouge Valley System, Izaak Walton Fly Fishers' Club, and local schools.

#### *10.2.27 East Humber Aquatic Habitat Rehabilitation*

Start Date: 1996                      Contact: Mark Heaton, Ontario Ministry of Natural Resources  
Status: New                              (905) 713 7406

Restoration of 5 km of cold water fish habitat will be undertaken in a major portion of the East Humber River that has a demonstrated carrying capacity for brown trout and the provincially significant redear sunfish. Monitoring of benthic and fish communities will be carried out to assess the success of the project. This project will also serve as a successful and well documented demonstration site for promoting public education and local community stewardship of the Humber River watershed. Interpretive trail signs concerning the project will be constructed. Funding will also be provided by the Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, City of Vaughan, Metropolitan Toronto and Region Conservation Authority, Friends of the Environment Fund, Ontario Federation of Anglers and Hunters, Ontario Streams, Action to Restore a Clean Humber, Izaak Walton Fly Fishers' Club, North Albion Collegiate, and local schools.

#### *10.2.28 A Fisheries Management Plan for the Highland Creek Watershed*

Start Date: 1996                      Contact: Bernie McIntyre, Metropolitan Toronto and Region Conservation Authority  
Status: New                              (416) 661-6600 ext 326

A Fisheries Management Plan will be prepared for the Highland Creek Watershed. Watershed fisheries management plans have been developed for the Rouge and Don Rivers watersheds and one is underway for the Humber River watershed. The Plan will not only provide information on the fish community, physical habitat and water quality, but will also identify management direction (targets), and critical issues and recommend rehabilitation activities, sites and priorities. This project will be integrated with the proposed Terrestrial Habitat Inventory and the analysis of aquatic habitats will be used to establish priority sites for riparian planting. The Fisheries Management Plan will provide a critical level of information to be used in assessing the impacts of future land use change. This project was also supported by the Ontario Ministry of Natural Resources, Regional Municipality of Metropolitan Toronto, City of Scarborough, and Metropolitan Toronto and Region Conservation Authority.

#### *10.2.29 A Fisheries Management Plan for the Humber River Watershed*

Start Date: 1996                      Contact: Bernie McIntyre, Metropolitan Toronto and Region Conservation Authority  
Status: New                              (416) 661-6600 ext 326

A Fisheries Management Plan will be prepared for the Humber River Watershed. Watershed fisheries management plans have been developed for the Rouge and Don Rivers watersheds and one is underway for the Highland Creek watershed. The Plan will not only provide information on the fish community, physical habitat and water quality, but will also identify management direction (targets), and critical issues and recommend rehabilitation activities, sites and priorities. The Humber Fish Plan is being conducted in concert with the work of the Humber Watershed Task Force and the development of a watershed strategy. The Fisheries Management Plan will provide a critical level of information to be used in assessing the impacts of future land use change and will establish an expectation of fisheries potential that can also be used to gauge how impacted the habitats are at present. This project is also supported by the Ontario Ministry of Natural Resources, Metropolitan Toronto and Region Conservation Authority, and Environmental Youth Corp.

#### *10.2.30 Habitat Rehabilitation Analysis - Humber River / Terrestrial Habitat Inventory - Highland Creek*

Start Date: 1996                      Contact: Chris Gertensorn, Metropolitan Toronto and Region Conservation Authority  
Status: New                              (416) 661-6600 ext 347

This project will plan and undertake reforestation activities on tableland, floodplain, and streambank lands within the Humber River watershed as identified by the GIS based forest resource analysis conducted under the 1995/96 Great Lakes 2000 Cleanup Fund ongoing project. It will also undertake a GIS based evaluation of forest resources within the Highland Creek watershed, in the City of Scarborough, in support of future reforestation activities and the development of a comprehensive Fish Management Plan. The forest resources evaluation will include an inventory of existing forest resources in the watershed, an assessment of the importance of these resources in relation to terrestrial and aquatic wildlife habitat and a three-dimensional terrain model of the watershed. This project is also supported by the City of



Scarborough, City of Vaughn, Region of Peel, Environmental Youth Corps, Metropolitan Toronto and Region Conservation Authority, Metropolitan Toronto Separate School Board, and Ontario Forestry Association/Trans-Canada Pipelines.

#### *10.2.31 Tommy Thompson Park - Embayment C Habitat Enhancement*

Start Date: 1996                      Contact: Scott Jarvie, Metropolitan Toronto and Region Conservation Authority  
Status:    New                              (416) 661-6600 ext 312

This project will develop detailed designs and implementation plans, design drawings and grading plans for fish and wildlife habitat rehabilitation efforts to be carried out at Embayment C of Tommy Thompson Park, west of the channel. The embayment is shallow, with little structural diversity and little to no vegetation. These plans will address the rehabilitation of 0.5 km of riparian/littoral habitat, 2 ha of wetland habitat, increased structural diversity of fish habitat, increased shoreline productivity via the establishment of aquatic vegetation zones and provision of reproductive and protective habitats for critical life stages of target species of fish and wildlife (i.e. northern pike). The creation of a structurally and biologically diverse shoreline and wetland habitat will increase the abundance and sustainability of native wildlife populations through the provision of specific habitat components. Establishment of the Marsh Monitoring Program protocol to monitor marsh bird and amphibian populations will be initiated in this wetland. The Regional Municipality of Metropolitan Toronto, and Metropolitan Toronto and Region Conservation Authority are also funding this project.

(Projects 10.2.32, 10.2.33 and 10.2.44 also deal with Tommy Thompson Park)

#### *10.2.32 Tommy Thompson Park Natural Resource Area Habitat Enhancement*

Start Date: 1996                      Contact: Jennifer Vincent, Metropolitan Toronto and Region Conservation Authority  
Status:    New                              (416) 661-6600 ext 349

This project will develop detailed designs, implementation plans, design drawings and grading plans (to provide linkages between critical habitat areas) and improved access to these areas from the base of Tommy Thompson Park. These linkages will be achieved through the creation of habitat nodes and corridors designed to maximize the diversity of habitats provided. The plans will address the creation and enhancement of 85 ha of riparian/littoral and 7 ha of wetland habitat, enhancement of structural diversity of habitat for a variety of fish and wildlife including regionally rare, threatened and endangered species, reptiles, resident and migratory birds, small mammals and warm water fishes. This initiative will also establish a variety of wetland and upland plants while promoting the development of successional plant communities through the use of a variety of techniques. Establishment of the Marsh Monitoring Program protocol to monitor marsh bird and amphibian populations will be initiated in this wetland. This project will also inform and involve public interest groups and the private sector on methods to conserve, restore and develop fish and wildlife habitat. The Metropolitan Toronto Remedial Action Plan Levy, and Metropolitan Toronto and Region Conservation Authority are also funding this project.

(Projects 10.2.31, 10.2.33 and 10.2.44 also deal with Tommy Thompson Park)

#### *10.2.33 Tommy Thompson Park Terrestrial Habitat Creation Enhancement*

Start Date: 1996                      Contact: Scott Jarvie, Metropolitan Toronto and Region Conservation Authority  
Status:    New                              (416) 661-6600 ext 312

This project will create and enhance 73 ha of riparian/littoral and 2 ha of wetland habitat, seasonally flooded pools and ponds for amphibians, mudflats and wet areas for migrating shorebird stopover and foraging, and structural habitat features (rock and bush piles) for terrestrial wildlife species (i.e. cottontails, fox, coyotes, rodents). It will also maximize edge habitat through the establishment of native vegetation that provides forage and shelter benefit to wildlife. Establishment of the Marsh Monitoring Program protocol to monitor marsh bird and amphibian populations will be initiated. The Regional Municipality of Metropolitan Toronto, and Metropolitan Toronto and Region Conservation Authority are also funding this project.

(Projects 10.2.31, 10.2.32 and 10.2.44 also deal with Tommy Thompson Park)

### *10.2.34 Terraview/Willowfield Watercourse Regeneration*

Start Date: 1996                      Contact: Paul Albanese / Ausra Wojciechowski, City of Scarborough  
Status:     New                                      (416) 396-7779

The final detailed design for the regeneration of the Terraview/Willowfield Parks as an urban forest will be prepared. The present concrete lined low-flow channel and floodplain will be modified into a meandering naturalized channel with associated wetlands. The installation of oil/grit separators designed to remove some of the hydrocarbons along with the voluntary disconnection of the downspouts will help create a more natural baseflow. The project is expected to improve water quality, create 12.2 ha of diverse terrestrial and wetland habitat (wetlands, meadows, woodlands and grasslands), provide for the development of downstream fish communities, enhance recreational opportunities and provide outdoor education. Project partners include the City of Scarborough, Metropolitan Toronto and Region Conservation Authority, and Ontario Hydro.

### *10.2.35 Habitat Target Testing - Humber River*

Start Date: 1996                      Contact: Chris Gertensorn, Metropolitan Toronto and Region Conservation Authority  
Status:     New                                      (416) 661-6600 ext 347

This project will establish a baseline of existing and historic wetland and riparian habitat conditions through the use of GIS technology and other tools. Existing data sources in the study area will be reviewed to determine their applicability for integration into a single GIS model. Existing habitat areas will be described and compared to the targets established in the Habitat Strategy; recommendations on application of the targets and rehabilitation projects required to move these targets forward, will be made. The model or pilot strategy, will be tested on the Humber River watershed of the Metropolitan Toronto and Region Area of Concern. The model will be used to identify and prioritize opportunities for rehabilitation against which to apply remedial action in the AOC. The model will also be used as an important resource in the development of a long-term habitat management plan for the Metropolitan Toronto and Region RAP. This project is carried out in partnership with Metropolitan Toronto and Region Conservation Authority.

### *10.2.36 Regeneration of Toogood Pond - Town of Markham*

Start Date: 1996                      Contact: Bernie McIntyre, Metropolitan Toronto and Region Conservation Authority  
Status:     New                                      (416) 661-6600 ext 326

Developed around 1879, on the upper Rouge River, Toogood Pond was the original millpond for the Village of Unionville. The original operation and subsequent reconstruction of the dam in 1981 created and sustained a large marsh complex upstream of the pond, which is presently considered a provincially significant Class 3 wetland. The dam constructed to create Toogood pond poses a barrier to the upstream movement of fish species. This "on-stream" pond has been accumulating sediment and slowly filling in over time; this has affected its habitat function and recreational use. Concept designs and construction drawings will be developed and finalized to mitigate the impact of the barrier to fish movement, enhance habitat for warm water fish species and regenerate riparian and wetland habitat through plantings. Implementation of these plans will contribute significantly toward delisting the Rouge River watershed. Project partners include Ontario Ministry of Natural Resources, Town of Markham, Metropolitan Toronto and Region Conservation Authority, Rouge Park Alliance, Markham Conservation Committee, Korean Community, and local schools and service clubs.

### *10.2.37 Bartley Smith Greenway Project (Don River) - Ecopark*

Start Date: 1996                      Contact: Adele Freeman, Metropolitan Toronto and Region Conservation Authority  
Status:     New                                      (416) 661-6600 ext 301

Ecopark and the Bartley Smith Greenway is a 15 km riparian greenbelt on the upper west Don River. The Metropolitan Toronto and Region Conservation Authority has taken this opportunity to create a diverse riparian wetland habitat at Keffer Marsh using conservation design and natural succession principles to enhance the fish and wildlife community and foster watershed stewardship with the business and residential communities. The created wetland complex will include a marsh and swamp component. Functional critical fish and wildlife habitat will be created for a variety of resident and target species through wetland and landscape diversity, the establishment of a variety of riparian vegetation and the development of successional plant communities. A variety of habitat creation and pollution prevention techniques will also be demonstrated. The Marsh Monitoring Program protocol will be used to monitor marsh bird and amphibian populations. Action 21, and Conservation Foundation are also funding this project.

### *10.2.38 Humber Stormwater Clean-up by Restoring Urban Biosystems - SCRUB*

Start Date: 1995                      Contact: Luciano Martin, Action to Restore a Clean Humber  
Status: Ongoing                      (416) 741-5346

In some areas of the Humber River there are direct discharges of stormwater onto the floodplain. As a result of these flow inputs, wetlands have been created or expanded. The impact of stormwater on the wetland in terms of the wetland's ability to effectively deal with the contaminants in the stormwater is generally unknown. Initially, monitoring the water quality entering and exiting an existing wetland at Rowntree Mills Park was carried out to determine the historical impact (beneficial or otherwise) of the stormwater on this wetland. This project will also provide an overview and summary of the storm sewer system accompanied by an assessment of the valley system in the Humber River watershed, through data compilation; monitoring will be limited to Black Creek and the Lower Humber River, where no data is available. The information collected is expected to help provide answers on the effectiveness and feasibility of wetlands for stormwater treatment which is becoming a popular way of polishing stormwater prior to final discharge. Partners in this project are the Ontario Ministry of Environment and Energy, Regional Municipality of Metropolitan Toronto, City of North York, City of York, Metropolitan Toronto and Region Conservation Authority, Action to Restore a Clean Humber (ARCH), and local schools.

### *10.2.39 Don Valley Brick Works Regeneration / Mud Creek Restoration*

Start Date: 1995                      Contact: Nick Saccone, Metropolitan Toronto and Region Conservation Authority  
Status: Ongoing                      (416) 661-6600 ext. 301

A provincially significant natural and cultural heritage site will be protected, enhanced and rehabilitated. This project includes the restoration and regeneration of a 30-acre worked out quarry, daylight and reconnection of a buried stream, the protection of an Area of Natural and Scientific Interest (ANSI) and the establishment of a native wetland and wildflower complex associated with 7 acres of wetland. The initial site grading, formation of the wetlands and initial soil amelioration were undertaken. The development of the concept designs and construction drawings for the rehabilitation of the former Brick Works site has been initiated. Detailed design includes the opening of the Creek through the site with provision of rocky ramps to enable future fish migration, and the flow diversion of Mud Creek to the Quarry wetlands to ensure that only base flow will enter the wetlands. The design will also include the creation of a 3 ha wetland complex (the largest constructed habitat wetland within the Don Watershed), inclusion of successional plant communities and the planting of approximately 10 ha of wildflower and open meadows. Funding partners include the Ontario Ministry of Natural Resources, Jobs Ontario, Regional Municipality of Metropolitan Toronto, Conservation Foundation of the Greater Toronto, Canadian Wildflower Society, Garden Club of Ontario, and W. Garfield Weston Foundation.

### *10.2.40 Coastal Wetlands Rehabilitation*

Start Date: 1995                      Contact: Mark Heaton, Ontario Ministry of Natural Resources  
Status: Ongoing                      (905) 713-7406

This project will coordinate the rehabilitation of degraded coastal wetland habitats along the Metropolitan Toronto waterfront to improve habitat and increase biodiversity. The four remaining coastal wetlands (Humber River marshes, Highland Creek Wetland Complex, Rouge River marshes and the Toronto Island wetlands) were re-evaluated to 1993 OMNR standards. Completion of the wetland evaluation has resulted in a net gain of 46.9 ha of provincially significant wetland and 123.8 ha of wetland protected under the Provincial Wetlands Policy Statement. Rehabilitation and restoration opportunities have been investigated, restoration plans are being devised and partnerships for implementation are being developed. This project is also supported by the Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, City of Scarborough, Metropolitan Toronto and Region Conservation Authority, Ontario Federation of Anglers and Hunters, Ontario Streams, and Rouge Park Alliance.

### *10.2.41 Rehabilitation of High Park's Grenadier Pond - Shoreline Rehabilitation Demonstration*

Start Date: 1994                      Contact: Murray Boyce, City of Toronto  
Status: Ongoing                      (416) 392-7264

Grenadier Pond is a degraded system which suffers from eutrophication and loss of fish and wildlife populations. A shoreline rehabilitation demonstration project was initiated as part of a long-term rehabilitation strategy for Grenadier Pond. This project involves the removal of approximately 75 m of concrete shoreline, the re-establishment of historical



nearshore and shoreline profiles, and the re-introduction of approximately 180 m<sup>2</sup> of native wetland and wet meadow plant material. Interpretive signage and trails will make the area more accessible to the public and enhance educational opportunities. The project is also funded by the City of Toronto, and Canadian National Sportsman's Show.

#### *10.2.42 Lower Don Demonstration Habitat Marsh - Chester Springs Marsh*

Start Date: 1993                      Contact: David Stonehouse, Task Force to Bring Back the Don  
Status: Ongoing                      (416) 392-1255

A small three hectare demonstration habitat wetland has been constructed in the lower Don River Valley. This project has provided the opportunity to learn more about the technology of constructing wetlands in Ontario's most urban environment. The rehabilitation of aquatic habitat has contributed to the ecological diversity in the Don River Valley. This wetland located in downtown Toronto serves as an ideal tool to promote public awareness of the importance of wetlands. Construction of the wetland was completed in June 1996. A multi-year comprehensive monitoring program for fauna and flora will be initiated. This project has triggered similar wetland creation initiatives along the Don River. The City of Toronto Department of Public Works and the Environment is acting in a project management capacity. The Ontario Ministry of Natural Resources, Canada-Ontario Infrastructure Program, Metropolitan Toronto Parks and Property Department, Metropolitan Toronto and Region Conservation Authority, Metropolitan Toronto and Region Remedial Action Plan, Friends of the Environment Foundation (Canada Trust), Lever-Pond's, Mountain Equipment Co-op, DMR Group, Branksome Hall Gaia Club, and various other private donors are also funding this project.

This project has triggered the following similar wetland initiatives in 1996, along the Don River:

*Riverdale Farm Pond Naturalization:* This project will complete all the design work to restore 2 ha of wetland and riparian habitat, to render the pond self-sustaining.

*Port Area Green Corridor Development:* This project will complete researching the requirements of functional wildlife corridors and the design of an appropriate one for the Port Area, adjacent to the Don Roadway. It will also design a model or prototype landscape along a 100 m portion, creating 100 m of riparian and terrestrial corridor habitat.

*Small Scale Aquatic Enhancement Project:* This project will initiate implementation of enhancement demonstration projects in two small aquatic habitat areas, and carry out the planning for 18 or more future sites throughout the Lower Don.

Partners for these three initiatives include the City of Toronto, Metropolitan Toronto and Region Conservation Authority, Toronto Economic Development Corporation, and numerous private donors and volunteers.

#### *10.2.43 Pottery Road Instream Barrier Mitigation*

Start Date: 1995                      Contact: Bernie McIntyre, Metropolitan Toronto and Region Conservation Authority  
Status: Ongoing                      (416) 661-6600 ext 326

In order to restore fish access to the upper Don River watershed, this project has redesigned and will implement modifications to two existing weirs at Pottery Road to allow passage by salmonids, northern pike, walleye and other species under spring and summer flow conditions. Spawning habitat for non-nest building species such as walleye and white sucker will also be created. Re-designing the weirs, also affords the opportunity to minimize any threat to public safety from the weirs while providing a portage route around the structures for the safe passage of canoeists. This project is also supported by the Metropolitan Toronto and Region Conservation Authority, and Regional Municipality of Metropolitan Toronto.

#### *10.2.44 Tommy Thompson Park - Embayment B Habitat Enhancement*

Start Date: 1995                      Contact: Gord MacPherson, Metropolitan Toronto and Region Conservation Authority  
Status: Ongoing                      (416) 661-6600 ext 246

Fish and wildlife habitat rehabilitation efforts at Embayment B of Tommy Thompson Park, on the Leslie Street Spit, involved the establishment of critical habitat nodes along the shoreline and open water section of the embayment. Wetland vegetation was established along the shoreline and reproductive, juvenile/nursery, resting/loafing, and overwintering areas were created for resident fish and wildlife species. In addition, structural fish habitat in the form of shoals, reefs, brush bundles and log cribs were strategically placed within the embayment. In-filling along the shoreline will be completed. The Regional Municipality of Metropolitan Toronto also funded this project.  
(Projects 10.2.31, 10.2.32 and 10.2.33 also deal with Tommy Thompson Park)

### *10.2.45 Forested Watersheds Coordination and Monitoring*

Start Date: 1994                      Contact: Mark Heaton, Ontario Ministry of Natural Resources  
Status:    On hold                      (905) 713-7406

Reforestation activities on floodplains and streambanks throughout the Metropolitan Toronto and Region AOC will be coordinated and facilitated through this project. The long-term effects of these reforestation activities including improvements instream ecosystem health, will also be monitored and evaluated. This activity will allow documentation of the quantitative increase in vegetative cover and other watershed improvements over time. In 1994/95 a systematic plan specifying planting locations in the Rouge River watershed was developed. Partners include the Ontario Ministry of Natural Resources, Metropolitan Toronto and Region Conservation Authority, and numerous volunteer groups.

### *10.2.46 Purpleville Creek Rehabilitation*

Start Date: 1995                      Contact: Mark Heaton, Ontario Ministry of Natural Resources  
Status:    Funding complete 1995 (905) 713-7406  
             Project ongoing

The overall goal of this project is to protect and restore 6.5 km of riparian habitat within the Purpleville Creek tributary of the East Humber River watershed. Protection and rehabilitation of riparian habitats degraded as a result of livestock grazing and urban construction activities is critical to restoring and sustaining a viable population of reddsidedace. Techniques to rehabilitate the watercourse are being demonstrated and implemented; these include fencing to restrict livestock access, stream crossings for cattle, provision of alternate watering sources, soil bioengineering, installation of in-stream fish habitat structures, and road culvert improvements, at selected priority sites. The Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Region of York, City of Vaughan, Metropolitan Toronto and Region Conservation Authority, Trout Unlimited Canada, North York Board of Education, York Region Board of Education, North Albion Collegiate, and local landowners and interest groups are also supporting this project.

### *10.2.47 Harding Park Regeneration*

Start Date: 1995                      Contact: John Nemeth, Town of Richmond Hill  
Status:    Complete                      (905) 771-8870

Harding Park is a widely used park in Richmond Hill. The construction of ponds to retain the flows from storms to prevent flooding has been part of the stormwater management strategy in the past. With increasing emphasis on an ecosystem approach, a project was initiated to upgrade stormwater management to include contaminant removal, channel naturalization, and enhancement of the natural features of the surrounding areas through plantings with local species. Since the park is well used by local residents, and there is a strong interest by community groups, this project emphasized public education by installing interpretive signage. This project was carried out in partnership with the Metropolitan Toronto and Region Conservation Authority, Town of Richmond Hill, Ontario Ministry of Environment and Energy, and various community groups.

### *10.2.48 Don Watershed Regeneration - Concept Sites Development*

Start Date: 1995                      Contact: Adele Freeman, Metropolitan Toronto and Region Conservation Authority  
Status:    Complete                      (416) 661-6600 ext 238

Along the Don River, there are many sites where stormwater ponds and associated areas need upgrading to enhance their function, include the removal of contaminants and provide a more natural environment for habitat. This project is intended to spur interest and involvement at various levels (community groups, municipalities, and the public) to develop concept sites and appropriate plans to achieve these objectives. The project is carried out in partnership with the Ontario Ministry of Environment and Energy, Metropolitan Toronto and Region Conservation Authority, Metropolitan Toronto and Region RAP, various municipalities and community groups.

### *10.2.49 Don Watershed Regeneration - Don Challenge*

Start Date: 1995                      Contact: Adele Freeman, Metropolitan Toronto and Region Conservation Authority  
Status:    Complete                      (416) 661-6600 ext 238

The Don Challenge provides an opportunity to involve the community at all levels in the actual work of regenerating the Don River. Specific types of activities would include inviting golf course managers to help develop improved practices.

encouraging schools and community groups to adopt parts of the Don River, involving groups to sponsor the building of wetlands and retrofitting stormwater ponds, inviting industry and commercial businesses to donate resources to develop projects, and encouraging university researchers to help monitor and determine the effectiveness of these actions to regenerate the Don River. Partners include the Metropolitan Toronto and Region Conservation Authority, Metropolitan Toronto and Region RAP, various municipalities, and community groups.

#### *10.2.50 Elgin Mills Cemetery Riparian Planting*

Start Date: 1995                      Contact: Bernie McIntyre, Metropolitan Toronto and Region Conservation Authority  
Status:    Complete 1995                      (416) 661-6600 ext 326

Approximately 1.6 km of riparian habitat were rehabilitated to provide shade and bank stabilization. Appropriate native trees and shrubs were planted along a small, but important coldwater tributary of the Rouge River. Fish habitat will be improved by extending the range of coldwater species (e.g. brook trout) and wildlife habitat will be improved by providing a linkage to natural areas upstream and downstream of the project site. Deer have been seen on site since the rehabilitation work took place. The Metropolitan Toronto and Region Conservation Authority, and Commemorative Services of Ontario also supported this project.

#### *10.2.51 Spring Creek Habitat Rehabilitation*

Start Date: 1995                      Contact: Bernie McIntyre, Metropolitan Toronto and Region Conservation Authority  
Status:    Complete 1995                      (416) 661-6600 ext 326

This project created approximately 270 m of new and shaded stream in the Rouge River watershed, by directing the flow of water from an unused flowing well. The channel was designed with the appropriate slope, temperature, substrate and riparian vegetation to support a self-sustaining coldwater fish community in an urban environment. Oxygenation of the water by directing it in the new stream, which currently flows underground through a pipe, is also expected to improve water quality. Native brook trout will be introduced as the habitat develops an appropriate invertebrate fauna. It is anticipated that the new creek will eventually support a self-sustaining population of native brook trout that will utilize both the new creek and the adjacent Robinson Creek. The Town of Markham, Metropolitan Toronto and Region Conservation Authority, Environmental Youth Corp, and Canada Trust also funded this work.

#### *10.2.52 Valley and Stream Corridor Rehabilitation*

Start Date: 1995                      Contact: Gary Wilkins, Metropolitan Toronto and Region Conservation Authority  
Status:    Complete 1995                      (416) 661-6600 ext 211

This project rehabilitated in-stream habitat for native benthic invertebrate and fish communities and established 3.4 km of riparian habitat along stretches of the main Humber River. Target coldwater fish species include brook trout and brown trout. Four sites have been identified for remedial works, including tree and shrub planting, livestock access restriction, wetland creation, and retrofitting pond outlets to improve water temperature. Educational opportunities were provided through presentations and public participation. The Metropolitan Toronto and Region Conservation Authority, Humberview High School, and numerous volunteers also supported this project.

#### *10.2.53 Restoration of Natural Habitat Structure*

Start Date: 1994                      Contact: Mark Heaton, Ontario Ministry of Natural Resources  
Status:    Complete 1994                      (905) 713-7406

This project recreated underwater structural complexity at sheltered warm water habitats along the Toronto waterfront, reducing the extent of habitat impairment caused by previous shoreline modifications. This activity, combined with others to restore water quality in the Metropolitan Toronto and Region AOC, will help to restore self-sustaining fish and wildlife populations to the area. This project added structure, by placing 55 brush shelter units and 21 logs and tree crowns at appropriate sites in Humber Bay Park East and Colonel Samuel Smith Park. Partners included Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, and Metropolitan Toronto and Region Conservation Authority.



#### *10.2.54 Habitat Rehabilitation on the Toronto Waterfront - Pilot Projects*

Start Date: 1992                      Contact: Gord MacPherson, Metropolitan Toronto and Region Conservation Authority  
Status:     Complete 1995                      (416) 661-6600 ext 246

In 1992, four fish habitat pilot projects were undertaken at the Toronto Islands, Scarborough Bluffers Park, Ashbridge's Bay and Etobicoke's Mimico Creek. The projects tested the feasibility and benefits of fish access improvements, wetland creation, shoreline naturalization and physical fish habitat creation. Phase II of the pike spawning habitat project at the Toronto Islands was undertaken in 1993, as was the work on the wetland at Mimico Creek. Shoreline naturalization and pike habitat rehabilitation at the Rouge River marsh, and wetland creation at Colonel Samuel Smith Waterfront Park were initiated in 1993. In 1994, the wetland creation work continued at Colonel Samuel Smith Park, with construction of an additional wetland in the boat basin. In 1995, an interpretive trail was opened for the Colonel Samuel Smith Park project. The successful outcome of the pilot projects will assist in evaluating habitat rehabilitation options at other locations on the Toronto Waterfront and other Great Lakes Areas of Concern. The projects were also supported by the Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Regional Municipality of Metropolitan Toronto, and Metropolitan Toronto and Region Conservation Authority.

#### *10.2.55 A Home for the Common Tern*

Start Date: 1990                      Contact: Hans Blokpoel, Environment Canada  
Status:     Complete 1994                      (613) 952-2410

Common terns at the Toronto Waterfront have been declining sharply in numbers due to encroachment of their nesting areas at the Eastern Headland, by nesting gulls and vegetation. Traditionally, common terns have been a highly visible component of the avifauna of the waterfront. This project has helped ensure that species diversity along the Metropolitan Waterfront is maintained and enhanced by providing suitable nesting habitat. Four rafts were built in 1990 as alternative nesting habitat for the terns. These rafts were installed and monitored at Tommy Thompson Park on the Leslie Street Spit each year since 1990. Over 170 fledglings were fledged in the first year, and more than 300 in each of the following years. Unhatched eggs were collected for contaminant analysis. In 1993, three permanent rafts (left in place over the winter) were constructed and installed. Snow fencing was suspended from the rafts to create artificial reefs for use by fish. These "reef rafts" provide shelter for fish as well as nesting habitat for birds. A reef raft was also installed at Trout Pond on Centre Island. In addition, a detailed study of the diet of tern chicks was carried out. This project was supported by Environment Canada's Environmental Conservation Branch, and Metropolitan Toronto and Region Conservation Authority.

### RURAL NON-POINT SOURCE POLLUTION

#### *10.2.56 Farm RAP Demonstration/Livestock Access Restriction - Rural Water Quality Program*

Start Date: 1993                      Contact: Anne Marie Weselan, Metropolitan Toronto and Region Conservation Authority  
Status:     Ongoing                              (416) 661-6600 ext 323

Agricultural remedial plans that will integrate soil, crop, livestock and water management issues, are being developed for farms. The measures undertaken include: septic system repair/replacement, manure management, milkhouse washwater disposal, livestock access restrictions and riparian/windbreak planting. Implementation of these measures will reduce bacterial and nutrient loadings to the receiving watercourses: Humber and Rouge Rivers and Etobicoke Creek. In addition to bacterial and nutrient load reductions of  $2.4 \times 10^{13}$  and 46.2 kg/yr respectively to the Humber River and  $1.0 \times 10^8$  and 0.003 kg/yr to the Etobicoke Creek, 1.77 km riparian habitat along the Humber River has been rehabilitated or protected. Implementation of a remedial program using proven techniques to restore water quality and test experimental designs which may help to further remediation technology and implementation of water quality improvement projects continues. Pre- and post-construction monitoring to illustrate the benefits of the project on water quality and benthic invertebrate populations is being conducted. Through demonstration projects, public education and awareness will be increased. Agriculture and Agri-Food Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Ontario Ministry of Agriculture, Food and Rural Affairs, Peel Region and York Region Health Departments, York On-site Sewage Systems Branch, Metropolitan Toronto and Region Conservation Authority, Ontario Soil and Crop Improvement Association, Metropolitan Toronto and Region RAP, and local landowners are also supporting this project.

## COMMUNICATIONS

### *10.2.57 Increasing Public Awareness of Water Quality Impacts in Urban and Rural Areas*

Start Date: 1993                      Contact: Anne Marie Weselan, Metropolitan Toronto and Region Conservation Authority  
Status:     Complete 1993                      (416) 661-6600 ext 323

Increased attention to the degraded state of many of our rural and urban watercourses has prompted the realization that remediation of these problems must begin at the source. Comprehensive educational materials including a multi-panel display, three-dimensional models, and associated information pamphlets were developed to illustrate sources of stormwater, its impacts, pathways, and remedial measures for its control. The materials were designed to appeal to school groups, municipal staff, and the general public. The Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, Metropolitan Toronto and Region Conservation Authority, and Ontario Science Centre also funded this project.

### 10.3 BAY OF QUINTE PROJECTS

The Bay of Quinte was designated as an Area of Concern (AOC) largely because of excessive nutrient levels. Bacterial and toxic contamination, and loss of fish and wildlife habitat have also been identified as problems in this AOC. The Bay of Quinte has completed its Stage 2 Report: "*Time to Act*", and implementation is well underway. The projects described below implement many of the recommendations contained in this document. The Great Lakes 2000 Cleanup Fund has supported 11 projects in the Bay of Quinte with \$2.2 million. With our partners' support, these projects have a total value of \$6.5 million.

#### SEDIMENT REMEDIATION

##### *10.3.1 Sediment Removal - Assessment of Meyers Pier Sediments*

Start Date: 1994                      Contact: Ian Orchard, Environment Canada  
Status: Ongoing                      (416) 739-5874

In 1994, an assessment of the nature and extent of sediment contamination at the Meyers Pier site bordering the Quinte/Moira River took place. Contaminants of concern include hydrocarbons, metals, and coal tar. Results of the assessment are being reviewed to determine future actions. The City of Belleville Parks Department, Ontario Ministry of Environment and Energy, and Fisheries and Oceans Canada are also funding this project.

#### URBAN RUNOFF

##### *10.3.2 Pollution Control Planning Study for the City of Belleville*

Start Date: 1995                      Contact: Ernie Margetson, Moira River Conservation Authority  
Status: Ongoing                      (613) 968-3434

The Bay of Quinte RAP has identified contaminant inputs associated with urban stormwater as one of the sources contributing to the Bay's bacterial, nutrient enrichment and toxic contamination problems. This project will identify actions to eliminate the sources of bacterial contamination and other pollutants from the City of Belleville. The report is at the draft stage and is being prepared for public input. The project is supported by the City of Belleville.

##### *10.3.3 Belleville Water Conservation Strategy*

Start Date: 1993                      Contact: Bryan Bushell, Belleville Public Utilities Commission  
Status: Complete                      (613) 966-3651

A feasibility study was conducted to develop the long-term strategic plan for the conservation of water resources in the City of Belleville. The Bay of Quinte RAP recommends that all municipalities in the Bay of Quinte basin implement water conservation programs. The City is seeking other sources of funding to implement the plan which will significantly reduce water use on a per capita basis, as soon as possible. The Belleville Utilities Commission also funded this initiative.

##### *10.3.4 Integrated Stormwater Management Strategy*

Start Date: 1992                      Contact: Ernie Margetson, Moira River Conservation Authority  
Status: Complete                      (613) 968-3434

Contaminant inputs associated with urban stormwater have been identified as one of the pollution sources contributing to the Bay of Quinte's water quality problems. To prevent new contaminant loads, municipalities bordering the Bay of Quinte must incorporate stormwater quality control for new urban development. Stormwater quality control requires treatment of the stormwater or improved plans for development. By emphasizing and encouraging sub-watershed land-use planning prior to development, the program controls stormwater loads associated with new developments without costly mechanical treatment. A program facilitator and office were established. A pilot sub-watershed plan was completed for the Potter Creek sub-watershed of the Bay of Quinte to promote early integrated planning on a sub-watershed scale. In this AOC, the Moira River Conservation Authority administered the stormwater management strategy on behalf of all agencies (Bay of Quinte RAP/PAC, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Moira River, Lower Trent Region, Prince Edward Region Conservation Authority, and Napanee Region Conservation Authority).



### *10.3.5 Reducing Phosphorus Load at Source - Water Conservation*

Start Date: 1991                      Contact: Fred Stride, Ontario Ministry of Environment and Energy  
Status:     Complete                      (613) 549-4000

The Town of Deseronto and the people of the Bay of Quinte Tyendinaga Territory participated in a demonstration project which assessed the impacts of water conservation on the quality of sewage treatment plant (STP) effluent discharge and sludge production. Householders were supplied with composters, water-saving devices and environmental awareness materials to promote voluntary/user-pays reductions in household phosphorus and water loads. Follow-up monitoring will track the amount of phosphorus entering and leaving the sewage treatment plant, the volume of liquid sewage entering the STP, the amount of chemical used to remove phosphorus from the liquid waste stream, the quality and quantity of sludge produced, and lastly, energy consumed. This information will be used to predict the impact on water quality in the Bay if all municipalities were to adopt these practices, and to promote the initiative in other areas. The project was cooperatively undertaken by Ontario Hydro, Ontario Ministry of Environment and Energy, Bay of Quinte RAP/PAC, Town of Deseronto, and the Mohawks of the Bay of Quinte.

### SEWAGE TREATMENT PLANT OPTIMIZATION

#### *10.3.6 STP Optimization at Federal Facilities - CFB Trenton and Warkworth Institution*

Start Date: 1994                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Ongoing                      (905) 336-6281

Upgrading the skills of sewage treatment plant (STP) staff is important in maintaining a consistent quality in the treated sewage on a day-to-day basis and in meeting the challenges of more stringent requirements for treated sewage. Technical assistance was provided to staff at the Warkworth Institution STP and CFB Trenton. As a result, RAP targets for phosphorus have been achieved. This project is also supported by Ontario Ministry of Environment and Energy, Correctional Services of Canada, and Department of National Defence.

#### *10.3.7 Evaluation and Process Upgrading at Canadian Forces Base (CFB) - Trenton*

Start Date: 1990                      Contact: Sandra Kok, Great Lakes 2000 Cleanup Fund  
Status:     Complete                      (905) 336-6281

The Bay of Quinte's RAP team has identified the CFB Trenton Sewage Treatment Plant as a significant contributor of nutrient loading to the Bay. This is a result of inadequate removal of phosphorus in the treated effluent, as well as, of the bypassing of some untreated sewage. The project developed recommendations on how to upgrade the treatment facility in order to meet RAP requirements.

### HABITAT REHABILITATION

#### *10.3.8 Black Tern Breeding Enhancement*

Start Date: 1990                      Contact: Hans Blokpoel, Environment Canada  
Status:     Funding complete 1995 (613) 952-2410  
                 Project ongoing

The black tern population of Ontario has declined over the past several decades, partially due to degradation and destruction of marsh habitat. During the 1994 and 1995 breeding seasons, artificial nesting platforms were installed at selected locations in the Bay of Quinte in an effort to improve the breeding success and increase the numbers of black tern pairs. This management technique had been used in other wetlands with varying success. Intensive surveys showed that there were only 28 black tern pairs in the entire Bay of Quinte in 1994, and 14 in 1995. Unfortunately, no terns nested on the platforms. However, a much better understanding of the habitat needs of these birds was gained thanks to this project. Furthermore, during our search in the vicinity of the Bay of Quinte, a large black tern colony was discovered near Bath; in 1997 good success was experienced with the nest platforms installed at that site. Environment Canada's Environmental Conservation Branch is also supporting this project.

### *10.3.9 Fish and Wildlife Habitat Restoration and Management*

Start Date: 1992                      Contact: Karen Hartley, Moira River Conservation Authority  
Status: Ongoing                      (613) 968-3434

Local land use practices and hydrological activities (e.g. flood control, lake level regulation) have destroyed and/or degraded the fish and wildlife habitats in the Bay of Quinte. A management strategy is being implemented to protect remaining wetland areas, and rehabilitate some coastal wetlands to improve the quality of fish and wildlife habitat. Fisheries and Oceans Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Environmental Youth Corp, Mohawks of the Bay of Quinte, Municipal Governments, Town of Picton, City of Belleville, Moira River Conservation Authority, Prince Edward Region Conservation Authority, other Conservation Authorities, Quinte Field Naturalists, Quinte Conservation Services Alliance, Eastern Habitat Joint Venture, Central Lake Ontario Sport Anglers, Ontario Fish Producers Association, Bay of Quinte RAP/PAC, Ontario Hydro, and private donors are also funding this project.

#### *Project Coordinator (Ongoing)*

The project coordinator will continue to provide ongoing and consistent project management for new and ongoing Bay of Quinte RAP initiatives. The Quinte Conservation Services Alliance is also funding this initiative.

Implementation projects focus on:

#### *Lead/Bismuth Sinker and Jig Exchange (Ongoing)*

About 160 kg of lead sinkers and jigs were collected and exchanged for bismuth or tin at major walleye tournaments and at bait and tackle shops. The "Take a Little Lead Out" program is expanding and will also provide educational and promotional materials on the environmentally-friendly alternatives to lead. The Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Environmental Education and Awareness Program, Environmental Partners Fund, Bay of Quinte RAP-IAC, Moira River Conservation Authority, Picton Kiwanis, W.I. Villager - Marshlands Trust Fund, Biologic Tackle, and others are funding this project.

#### *Big Clean-up Trailer (Ongoing)*

A travelling environmental show designed to increase public awareness for the Bay of Quinte environmental concerns has hosted over 8,000 people at a total of 27 events. This project will continue to conduct the travelling environmental show to increase public awareness for local environmental concerns in the Bay of Quinte. Partners include the Environmental Youth Corp, Environment Canada's Restoration Program Division, Ontario Ministry of Environment and Energy, Quinte Conservation Authorities, exhibitors, and local industries and businesses.

#### *Nearshore Habitat Mapping (Ongoing)*

A remote sensing "Habitat Atlas" showing critical, non-critical, or degraded habitat for the Upper and Middle Bay of Quinte is in preparation and is expected to be produced and published in 1996/97. This project is also funded by Fisheries and Oceans Canada, Ontario Ministry of Natural Resources, Ontario Ministry of Environment and Energy, Municipal Governments, and Conservation Authorities.

#### *Landowner Contact (Ongoing)*

This project is securing priority wetlands through purchase, land tax rebates and landowner rebates, it also assists private landowners in the implementation of small-scale habitat restoration projects and increases public awareness of the importance of these habitats. One hundred and seventeen landowners of wetland or shoreline were contacted to promote the values of these habitats. Approximately 96 ha of wetland were secured and 4 km of riparian habitat were restored or protected. Partners include the Ontario Ministry of Natural Resources, Eastern Habitat Joint Venture, Quinte Conservation Services Alliance, and Environmental Youth Corp.

#### *Lake Sturgeon Rehabilitation Plan (Ongoing)*

Background material and monitoring data have been collated, and rehabilitation options for lake sturgeon have been evaluated. There is a remnant population of lake sturgeon in the Bay of Quinte. Two tributaries have been identified for possible remediation of spawning habitat. A video promoting the value of lake sturgeon and the importance of the clean-up of the Bay of Quinte habitats to the rehabilitation of the lake sturgeon populations is being produced. This project is also funded by the Ontario Ministry of Natural Resources, Mohawks of the Bay of Quinte, Ontario Fish Producers Association, and Central Lake Ontario Anglers.

#### *Belleville to Pointe Anne Significant Areas Project (Ongoing)*

A project to protect and manage significant wetlands, shoreline and alvar habitats from Belleville to Pointe Anne was initiated. A strategic plan to protect and manage the environmentally sensitive areas is being developed.

#### *East Bayshore Rehabilitation (Ongoing)*

Naturalization of up to 1.5 km of shoreline by establishing wetland vegetation and enhancing fish habitat was initiated; it includes coordination and implementation of biomonitoring (birds and amphibians), coordination of shoreline naturalization plans, and the design and construction of nearshore structures for the development of marsh communities along the Park's waterfront. The Environmental Assessment is under review. Ontario Ministry of Natural Resources, Environmental Youth Corp, City of Belleville, Jobs Ontario, Belleville Fish, Game Club, and others are funding this project.

#### *Green Shore Wall Workshop (Complete)*

A one-day workshop was held to present information on shoreline alterations, soil bioengineering techniques and field experiences to promote the use of these more environmentally-friendly techniques by the people closely associated with permit approval and project implementation. Partners include the Ontario Ministry of Natural Resources, Eastern Habitat Joint Venture, Quinte Conservation Services Alliance, and others.

#### *Belleville Marsh (Ongoing)*

Conceptual designs for habitat enhancement and stormwater remediation have been completed and alternate snow dump sites were evaluated. A range of options for improving habitats at Belleville Marsh was provided. The activities also include: coordination of garbage clean-up, coordination, review and audit design study for habitat enhancement, stormwater and snow dump remediation, coordination and implementation of biomonitoring, organization and coordination of nest box construction and installation. In 1996, this project will complete the Environmental Assessment and proceed with permit requirements. Partners include the Ontario Ministry of Environment and Energy, Ontario Ministry of Natural Resources, Environmental Youth Corp, City of Belleville, Moira River Conservation Authority, Quinte Field Naturalists, Friends of Belleville Marsh, Laidlaw Waste Systems, and Moira Secondary School.

#### *Mud Creek Wetland Evaluation (Complete)*

The 400 ha coastal wetland in Mud Creek marsh was evaluated and rated as Provincially Significant, primarily because of the presence of several significant species and habitats. Partners include the Ontario Ministry of Natural Resources, and Mohawks of the Bay of Quinte.

#### *Marsh Creek Wetland Rehabilitation (On hold)*

Stream rehabilitation, naturalization and spawning habitat creation were initiated at Macauley Creek. A volunteer-based amphibian and bird biomonitoring program was coordinated. The Environmental Assessment and pond study are still underway. Ontario Ministry of Environment and Energy, Town of Picton, Prince Edward Region Conservation Authority, and Ontario Hydro also funded this initiative

#### *Shoreline Naturalization (Complete)*

The naturalization projects in Centennial Park, H.J. McFarland Conservation Area and Sidney Water Treatment Plant have been completed. Additional projects are being organized and coordinated under the *Landowner Contact* project.

#### *Native Plant Promotion (On hold)*

A Native Plant Promotion program was initiated. Promotion will include educating the public on the benefits of using native plants, encouraging habitat restoration and naturalization, motivation of plant distributors and other organizations and inviting public participation. Partners in this initiative include the Environmental Youth Corp, and Bay of Quinte Conservation Authorities.



## RURAL NON-POINT SOURCE POLLUTION

### *10.3.10 Agricultural Diffuse Source Control Strategy Implementation*

Start Date: 1992                      Contact: Barry Jones, Lower Trent Region Conservation Authority  
Status: Ongoing                      (613) 394-3915 ext. 13

The Bay of Quinte RAP has determined that reducing phosphorus loadings from tributaries is the most cost-effective way of reducing phosphorus loading to the Bay. To achieve RAP restoration goals, a 10% reduction in tributary phosphorus loadings (25% of agricultural loadings) is recommended. This target will be achieved if 30% (70,000 ha) of the Bay of Quinte basin's crop land is converted from conventional to conservation tillage. A Rural Diffuse Source Control Strategy for the Bay of Quinte Watershed was completed in 1993; its implementation began in 1994. In its second year of implementation, the project will complete water quality improvements based on the landowner contact program. These projects include reduced tillage and no-till Best Management Practices (BMPs), upgrading household sewage systems, manure storage systems, livestock access restriction projects, and more. A computer model, "Environmental Source Reduction Accounting Model (ESRAM)", designed to quantify the loading reductions of phosphorus and bacteria from site/landowner specific and "Habitat Strategy" projects, was developed and tested. The ESRAM will be modified to weigh more accurately, at a detailed level, the relative merits between specific remediation opportunities. The delivery ratio will be made adjustable based upon site-specific variables, including buffering factors and delivery distance. Improved default values and additional factors which better reflect on-the-ground conditions will be incorporated into the model. This project, locally called the Rural Water Quality Program, has been undertaken in partnership with Agriculture and Agri-foods Canada, Ontario Ministry of Environment and Energy, Ontario Ministry of Agriculture, Food and Rural Affairs, Lower Trent Conservation Authority, Bay of Quinte RAP/PAC, Ontario Soil and Crop Improvement Association, and Mohawks of the Bay of Quinte.

### *10.3.11 Cold Creek Agricultural Improvements*

Start Date: 1991                      Contact: Jim Kelleher, Lower Trent Region Conservation Authority  
Status: Complete                      (613) 394-4829

Runoff from agricultural land is a significant source of nutrient loading to the Bay of Quinte. Cold Creek is a major tributary of the Trent River just upstream of the Bay. This project cleaned-up a specific source of contamination, and more importantly provided a stimulus for further action by the agricultural community to clean-up similar problems. The Moelker farm represents a comprehensive demonstration site where many techniques were employed to improve the quality of a stream passing through a farming operation. An enhanced buffer strip (consisting mainly of trees, sod) between the farm and stream has been established, along with the construction of an in-ground concrete manure storage facility which stores the waste from over 100 animals. It also handles the runoff from the barnyard and the milkhouse washwater waste. In October of 1991, the project was included on a farm tour. This project was featured in a Bay of Quinte RAP video produced by the PAC. Partners involved in the project include the Lower Trent Region Conservation Authority, Ontario Ministry of Agriculture, Food and Rural Affairs, Bay of Quinte RAP/PAC, and local landowners.

## 10.4 PORT HOPE PROJECTS

Port Hope is located at the mouth of the Ganaraska River on the north shore of Lake Ontario. Approximately 90,000 m<sup>3</sup> of sediment located in the turning basin and west slip area of Port Hope Harbour are contaminated with uranium and thorium series radionuclides, heavy metals and PCBs. This contamination is the result of past waste management practices in the refining and processing of uranium and radium during the 1930s and 1940s. The Remedial Action Plan (RAP) Stage 1 Report has been completed, and preparation of the Stage 2 document is underway. The Great Lakes 2000 Cleanup Fund has supported 2 projects with \$16,000 for the Port Hope AOC. With our partners' support, this project have a total value of \$123,000.

### SEDIMENT REMEDIATION

#### *10.4.1 Port Hope Bench-scale Demonstration - Eriksson Systems*

Start Date: 1995

Contact: Ian Orchard, Environment Canada

Status: Ongoing

(416) 739-5874

A bench-scale demonstration of the Eriksson Sediment Systems removal and handling technology was held in the Port Hope Harbour Turning Basin where sediments are contaminated with uranium and thorium radionuclides, heavy metals and PCBs. The innovative process freezes contaminated sediment before it is removed from the water. Frozen sediment blocks are then lifted without risk of spillage and thawed upon relocation to an appropriate facility. The disposal of less than 1 m<sup>3</sup> of residue from the demonstration was handled by Atomic Energy of Canada Limited (AECL). Partners include Ontario Centre for Environmental Technology Advancement, Atomic Energy of Canada Limited, and Eriksson Systems.

## 11.0 ST. LAWRENCE RIVER PROJECTS

The St. Lawrence River is an international boundary between Canada and the United States. The Canadian and American Remedial Action Plans (RAPs) are being developed separately. The Canadian RAP Stage 2 Report is expected to be completed by September 1997. The Great Lakes 2000 Cleanup Fund has supported eight projects with over \$800,000 for the St. Lawrence River RAP. With our partners' support, these projects have a total value of more than \$2 million.

### SEDIMENT REMEDIATION

#### *11.0.1 Sediment Removal and Treatment - Courtaulds Site*

Start Date: 1994                      Contact: Simon Llewellyn, Environment Canada  
Status: Ongoing                      (416) 739-5939

In preparation for a pilot-scale sediment removal and treatment demonstration, sediment from the St. Lawrence River at the Courtaulds Fibre Plant site has been collected and analyzed. Treatability tests have been conducted on the sediment in three phases. Sediment grain size, density, water content, settling characteristics and thermal properties were measured. In addition, chemical analysis was performed to determine if some form of fractionation of the sediment would reduce remediation costs. Pending the results of the pilot-scale demonstration, planning will begin for full-scale remediation. The Ontario Ministry of Environment and Energy and Environment Canada's National Water Research Institute, Courtaulds, Fluor Daniel Inc., City of Cornwall, and University of Western Ontario are also supporting this project. On the American side of the river at Massena (New York) two sediment removal projects have been completed and another is planned for this year.

### URBAN RUNOFF

#### *11.0.2 Retrofit of Fly Creek Stormwater Pond*

Start Date: 1995                      Contact: Andy Code, Raisin River Conservation Authority  
Status: On hold                      (613) 938-3611

The Cornwall Pollution Control Planning Study identified the Fly Creek catchment area as a particularly significant component of the City's total wet weather contaminant loading (25%) to the Area of Concern. This project will provide innovative options for the redesign and retrofit of the existing Fly Creek stormwater pond to optimize its contaminant removal capabilities, enhance its wildlife habitat value, improve the site's aesthetic amenities and create passive recreational use potential. Various options for retrofitting the pond are currently being evaluated. The Ontario Ministry of Environment and Energy, and Raisin Region Conservation Authority are also supporting this project.

#### *11.0.3 Pollution Prevention and Control Planning Study*

Start Date: 1992                      Contact: Peter Seto, Burlington Environmental Technology Office  
Status: Complete                      (905) 336-6438

The City of Cornwall, in partnership with Environment Canada's Great Lakes 2000 Cleanup Fund and Ontario Ministry of Environment and Energy, initiated a study to investigate direct municipal discharges to receiving waters in the St. Lawrence River Area of Concern. The study, termed a Pollution Prevention and Control Plan (PPCP), aimed to identify and quantify the sources of pollution from the municipality and to develop a plan which prioritizes the action items. The PPCP was completed in 1995. Recommendations for addressing combined sewer overflow (CSO), stormwater and the sewage treatment plant are provided in the final report. Key recommendations include (i) providing storage using tanks and/or satellite treatment for CSO control; (ii) providing water quality function for a major stormwater pond; and (iii) identifying and evaluating options for upgrading the primary sewage treatment plant to secondary treatment.



## HABITAT REHABILITATION

### *11.0.4 Habitat Target Testing Strategy - Testing Habitat Targets Framework*

Start Date: 1996                      Contact: Ian Gillespie, Geomatics - Environment Canada  
Status:    New                                      (905) 336-4527

This project will apply the habitat rehabilitation prioritization approach suggested in the report "A Draft Framework for Guiding Habitat Rehabilitation in the Great Lakes Areas of Concern" to the St. Lawrence River AOC. Geographic Information Systems Technology will be incorporated to delineate, analyse and graphically display woodlot location and riparian habitat on full colour thematic maps at an appropriate scale. The digital database and plots produced will provide users with a yardstick to measure the extent of fish and wildlife habitat within the watershed's 572 m<sup>2</sup>. Existing habitat areas will be described and compared to the targets established in the Habitat Strategy; recommendations on application of the targets and rehabilitation projects required to move these targets forward, will be made. By implementing this technology, we can efficiently isolate those areas where time and money can be effectively spent to rehabilitate habitat within the AOC. Partners in this project include Environment Canada, and Ontario Ministry of Natural Resources.

### *11.0.5 Pointe Mouillee - Bainsville Bay Habitat Rehabilitation*

Start Date: 1991                      Contact: Andy Code, Raisin Region Conservation Authority  
Status:    On hold                                      (613) 938-3611

This project, together with related work by Ducks Unlimited Canada and the Eastern Habitat Joint Venture of the North American Waterfowl Management Plan, will rehabilitate a significant peninsula wetland complex. The area is important both for waterfowl staging and fish spawning and rearing (yellow perch, pike, largemouth bass, brown bullhead, panfish and smallmouth bass). The shoreline will be stabilized to prevent erosion and improve circulation as to restore nearshore fish habitat. Design considerations for the project have been completed, however the project is currently on hold pending negotiations with landowners. Other partners include the Ontario Ministry of Natural Resources, Township of Lancaster, and Raisin Region Conservation Authority.

### *11.0.6 Habitat Rehabilitation - Littoral Zone Cornwall Waterfront*

Start Date: 1992                      Contact: Mike Eckersley, Ontario Ministry of Natural Resources  
Status:    Ongoing                                      (613) 258-8204 ext. 303

The part of the St. Lawrence River which flows past the City of Cornwall has been degraded due to construction of the St. Lawrence Seaway and shoreline development in the city. Loss of habitat has been identified as a major concern in the St. Lawrence River RAP. Habitat deficiencies along 8 km of the Cornwall waterfront on the St. Lawrence River have been investigated. Eighteen separate remediation initiatives to restore aquatic habitat diversity and increase public awareness of local environmental issues, are underway. In addition to the three reefs built off Lamoureux Park, an artificial island with a substantial underwater reef component was also constructed to enhance structural diversity and provide shelter and food. Preliminary findings indicate increases in the number of fish and fish species using the structures. To date, 1.2 km of riparian habitat have been rehabilitated. Two additional reefs will be constructed in 1996/97, to improve aquatic habitat diversity and increase both the diversity and production of the fish community. Creation of 2 wetlands and a natural creek, at the Rotary Eco-Gardens project, will be initiated during the winter of 1997. These projects are also funded by the Ontario Ministry of Natural Resources, City of Cornwall, Raisin Region Conservation Authority, Public Advisory Committee, Rotary Club, Lunkers Club, and numerous volunteers.

### *11.0.7 Habitat Projects Coordination*

Start Date: 1992                      Contact: Mike Eckersley, Ontario Ministry of Natural Resources  
Status:    Ongoing                                      (613) 258-8204 ext. 303

Coordination of the three ongoing fish and wildlife habitat and rural non-point source pollution control projects is underway. A network of volunteers trained to monitor wildlife populations in the St. Lawrence River AOC continues to be established. This project is also supported by the Ontario Ministry of Natural Resources, Raisin Region Conservation Authority, and local volunteers.

## RURAL NON-POINT SOURCE POLLUTION

### *11.0.8 Lake St. Francis Tributary Restoration*

Start Date: 1992                      Contact: Andy Code, Raisin Region Conservation Authority

Status:    Ongoing                      (613) 938-3611

An ecosystem approach to small stream watershed management on three creeks (Sutherland, Wood and Gunn) is demonstrating the combination of on-land and in-water activities to restore the aquatic habitats to full function. Initial efforts were directed towards habitat and water quality rehabilitation for Sutherland Creek, but have now been expanded to include all tributaries in the St. Lawrence River (Cornwall) AOC. The focus continues to be on controlling excess nutrients, reducing erosion, restoring water flows, rehabilitating in-stream habitat diversity and re-establishing buffer strips. The application of these techniques will be spread to the other tributaries in the St. Lawrence River AOC through a stewardship program. The Ontario Ministry of Natural Resources, Raisin Region Conservation Authority and volunteers from the community are also supporting this project.









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